DOCUMENT RESUME

ED 184 382 HE 012 156

AUTHOR	Naginey, Charles H., Ed.; Thomas, Charles R., Ed.
TITLE	Planning Higher Education Information Systems for the 1980's. Proceedings of the 1979 CAUSE National Conference (November, 1979, Orlando, Florida).
INSTITUTION	CAUSE, Boulder, Colo.
PUB DATE	Nov 79
NOTE	862p.
AVAILABLE FROM	CAUSE, 737 29th Street, Boulder, CO 80303.
EDRS PRICE	MF05/PC35 Plus Postage.
DESCRIPTORS	College Administration; Computer Programs; Computers; Data Analysis; Data Collection; Decision Making; Futures (of Society); *Higher Education; Industry; Information Needs; *Information Processing; *Information Systems; *Management Information Systems; *Planning; Technological Advancement
IDENTIFIERS	*Information Management

ABSTRACT

The development, use, and management of information systems in higher education are examined in these proceedings of the 1979 College and University Systems Exchange (CAUSE) National Conference. General sessions deal with computer management to data resource management and institutional perspective for the 1980's. The remaining sessions are divided according to six general areas: management and information systems; development of information systems; use of information systems; small college information systems; vendor presentations; and contributed paper sessions (abstracts). Most of the 50 professional papers are included, such as: Management and Technology in Higher Education in the 1980's (Ronald W. Brady); Office of the Future--Today (Rosemary Nash); A Look at Information Processing of the 80's (Allen D. Hoffman); Integrating the Institutional Decision Process (Richard Kreigbaum); The MSA Approach (Management Science America, Jon Gearhart); Query by Example (QBE) (IBM Corporation, John Lattig); Advisement and Graduation Information System (J. Terrence Kelly, Gloria K. Norman, and Richard B. Echinoff); and The Impact of the Growth of the Applications Software Industry and Systems Development in the 1930's (Tim Orwick and John P. Imlay, Jr.). (LC)

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Planning Higher Education Information Systems For the 1980's

Proceedings of the
1979 CAUSE National Conference

November 1979
Orlando, Florida

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HE 012 156

Edited by
Charles H. Naginey
and
Charles R. Thomas

CAUSE

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INTRODUCTION

At this year's CAUSE National Conference we continued to explore the mission of CAUSE -- The Development, Use, and Management of Information Systems in Higher Education. The challenge was to develop the mission in the context of the 1980's — a new decade with new and exciting opportunities. The theme which focused our attention was — Planning Higher Education Information Systems for the 1980's.

The goal of the Program Committee was to provide a wide variety of presentations emphasizing the theme and the ways in which higher education management might plan, understand, and use information systems. There were two keynote speakers and over fifty professional papers presented during the conference. Most of these papers are included with these proceedings.

We trust these proceedings will provide a continuing reminder of the many activities of the CAUSE organization. Furthermore, we encourage you to utilize CAUSE to complement your individual efforts and thus strengthen your organization's management capabilities through improved information systems.

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CAUSE, the Professional Association for Development, Use, and Management of Information Systems in Higher Education, helps member institutions strengthen their management capabilities through improved information systems.

Formerly known as the College and University Systems Exchange, CAUSE first organized as a volunteer association in 1962 and incorporated in 1971 with 25 charter institutions. That same year the CAUSE National Office opened in Boulder, Colorado with a professional staff to serve the membership. Today the organization has grown to 300 member institutions with 1,100 member representatives and continues to grow.

CAUSE provides member institutions with many services to increase the effectiveness of their administrative information systems. These services include: the Exchange Library, which is a clearinghouse for non-proprietary information systems contributed by members; an Information Request Service to locate specific systems or information; consulting services to review ADP organizations and management plans; organizational publications including a bi-monthly professional magazine; and the National Conference.

The CAUSE National Conference provides an excellent forum for the exchange of ideas, systems, and experiences among the many speakers and participants. The Proceedings provide a continuing reference to the many activities of the Conference.

Charles H. Naginey
1979 Conference
Chairman

Patricia C. Skarulis
1979 Conference
Vice-Chairman

Charles R. Thomas
Executive Director
CAUSE

ACKNOWLEDGEMENTS

The success of the CAUSE National Conference is due entirely to the contributions of people and supporting organizations. Although it would be impossible to identify all of the people who contributed time and effort to the planning and operation of the 1979 Conference, several deserve special note.

The Program Committee, with the CAUSE Staff, spent many hours to produce an effective and smoothly run conference. Their enthusiasm, efforts and the support of their institutions are gratefully acknowledged.

1979 CAUSE NATIONAL CONFERENCE PROGRAM COMMITTEE

Seated from left to right: Charles H. Naginey, Pennsylvania State University; Maureen Murphy, University of Oklahoma; Donald F. Tiernan, University of Wyoming; Dorothy J. Hopkin, University of Illinois. Standing from left to right: Patricia C. Skarulis, Princeton University; Charles R. Thomas, CAUSE; Warren H. Groff, North Central Technical College; Dennis Berry, University of Colorado; Bill D. Morris, University of Central Florida. (Not Pictured) Nellie Hardy, University of Arkansas at Pine Bluff.

The logistics of conference registration were efficiently supervised by Ms. Jane Knight of the CAUSE Staff with the assistance of Mrs. Fran Brauer of the University of Central Florida and Mrs. Jan Welch of the State University System of Florida. Their efforts and friendly smiles are appreciated.

The advance preparation for the Conference and the publication of the proceedings require a great deal of professional expertise and effort. The contributions of Mr. Robert Byrd and Mrs. Deborah Smith of the CAUSE Staff are sincerely appreciated.

The continuing support of the CAUSE Board of Directors and the membership they represent is also gratefully acknowledged.

1979 CAUSE BOARD OF DIRECTORS

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Suite 630 One Dupont Circle
Washington, D.C. 20036
The Document Number is: HE 012156*

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GENERAL SESSION

WEDNESDAY KEYNOTE ADDRESS

Richard L. Nolan
Chairman
Nolan, Norton & Company, Inc.

COMPUTER MANAGERS TO DATA RESOURCE MANAGERS

COMPUTER MANAGERS TO DATA RESOURCE MANAGERS

Richard L. Nolan

Nolan, Norton & Company, Inc.

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Richard L. Nolan

Computer Managers to Data Resource Managers

Data Processing management is experiencing a fundamental transition with advanced stages of growth. Applications are being retrofitted with data base/communications technology and restructured for exploitation of data resources. Terminals and mini/microcomputer technologies are placing computer power into the user hands. Data processing expenditures respond with alarming growth rates. Should top management stop, slow down, or promote the growth?

"I'm telling you I want the Flow of Goods computer-based system, and I am willing to pay for it. And you are telling me I can't have it after we have approved your fourth running annual budget increase of over 30 percent. If you can't provide the service, I'll get it outside. There are now reliable software companies around, and my people tell me that we should take seriously a proposal that we received from a large minicomputer vendor."

The Vice President of Information Services response to the company's steering committee member wasn't well received:

"I'm at the edge of control. It isn't any longer a question of financial resources. My budget has grown from $30 million in 1975 to over $70M in 1978. The technology is getting ultra-complex. I can't get the right people fast enough, let alone provide suitable space and connections to our sprawling computer network."

Upon returning to his office, the VP of Information Services knew that the Steering Committee member would be going ahead with the minicomputer. There was no way that the technical staff could provide the Flow of Goods functions for the money or within the timeframe that the minicomputer vendor had promised. But something wasn't right, even though he couldn't put his finger on it.

The VP of Information Services mused at the irony of it all. Five years ago, he was brought in to set up a corporate computer utility after a similar period of ill-understood growth—that budget growth was the undoing of his predecessor. Now key questions were being asked about a similar growth pattern of the DP budget by the president and he frankly didn't have the answers.

The Answers Are Not Obvious

Several large companies have been recently gripped by a resurgent and rather confusing data processing (DP) budget growth. The DP budget growth is similar to the rapid growth experienced by many companies in the mid to late 1960's. It is confusing because the senior managements of these companies thought that the DP control structures put in place during the 1970's such as chargeout, project management, and consolidations of computing activities under tight budgetary control, would effectively contain any future budget growth. Nevertheless, the annual DP budget growth rates are exceeding 30 percent. Further, these annual DP budget increments are equal to the total size of the budgets four or five years ago. The confused senior management of these companies are searching for answers as to what underlies this growth? Is it good? What are the limits?

The answers are not obvious, but a probing of the status of the data processing activities in these companies and the current technological environment sheds light on the situation and provides insights into some actions to prepare for managing the growth. First, we will examine an update of the Four Stages Theory[1] to identify the underlying DP evolutionary forces. Second, we will examine the causes and dynamics of the user-driven Stage IV DP budget growth. Third, we will identify appropriate senior management actions to prepare for and manage the growth.

Six Stages of Data Processing Growth

In 1973, I presented a descriptive stage hypothesis on the evolution of data processing in companies. The stage hypothesis was based upon the discovery that the DP expenditures of three companies studied in depth formed an "S"-shape learning curve pattern when plotted over time. The learning curve phenomenon is a product of organizational learning within the company; top management, middle management, operational management, and end-users learn to apply the computer technology to their respective areas and problems.

My case studies included companies that had clearly experienced Stage I, II, and the early part of Stage III. Thus, my Four Stages hypothesis was based upon partial extrapolation of Stage III and full extrapolation of Stage IV–I had not actually observed the Stage IV environment. Nevertheless, the identification of the learning curve phenomenon through the DP expenditure pattern, and the explanation of organizational learning through the four growth processes of: (1) building an applications portfolio, (2) building a DP organization, (3) building a DP planning and control system, and (4) developing user awareness, was solidly based in empirical observations. And as substantiated with a wealth of further observations by the author and others, the description is accurate for both profit and non-profit organizations. However, empirical observation of the latter part of Stage III had an anomaly. In the latter part of Stage III, there was a consistent pattern of introduction of data base technology. But most surprising was a resurgence of DP expenditure growth during Stage IV rather than a leveling off as predicted earlier. Several alternative hypotheses could explain this phenomenon.[2] One was that the introduction of data base technology which typically takes place in Stage III sets off another learning curve as the organization learns to restructure itself to manage data resources instead of a computer resource.

Although I was able to corroborate the data resource stage hypothesis with the 35 companies in which we had carried out stage audits, I still did not have a large enough sample to verify the hypothesis. This missing piece fell

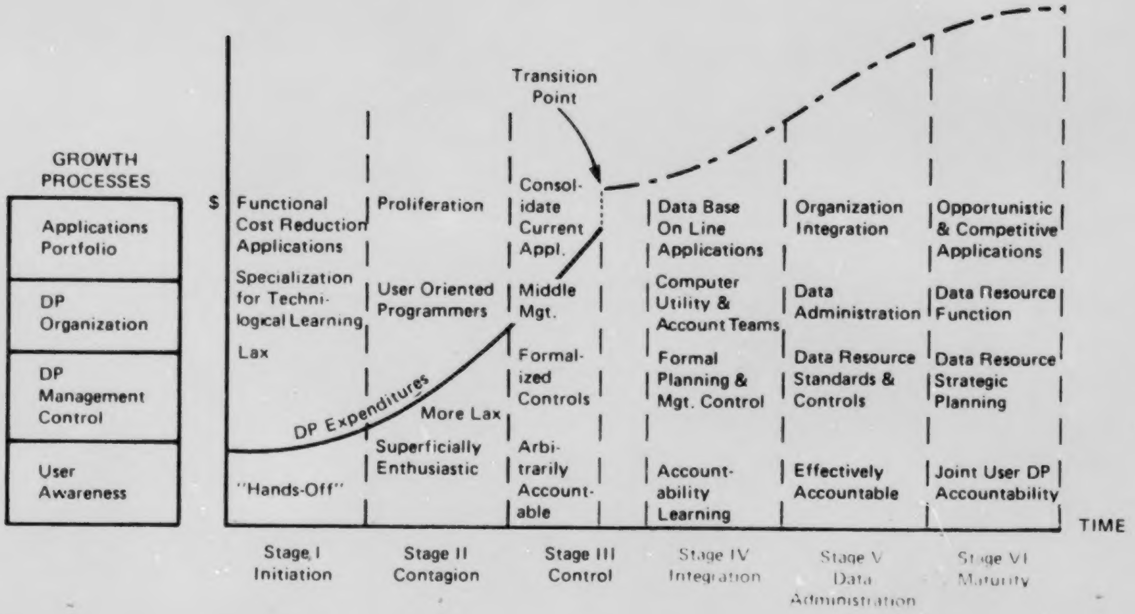
---

[1] Richard L. Nolan, "Managing the Computer Resource: A Stage Hypothesis," Communications of the ACM, July, 1973, pp. 399–405.

[2] Richard L. Nolan, "Thoughts on the Fifth Stage," Data Base, Fall-Winter, 1975.

EXHIBIT I

SIX STAGES OF DATA PROCESSING GROWTH


GROWTH PROCESSES
Applications Portfolio
DP Organization
DP Management Control
User Awareness
$
Transition Point
DP Expenditures
Functional Cost Reduction Applications
Specialization for Technological Learning
Lax
"Hands-Off"
Proliferation
User Oriented Programmers
More Lax
Superficially Enthusiastic
Consolidate Current Appl.
Middle Mgt.
Formalized Controls
Arbitrarily Accountable
Data Base On Line Applications
Computer Utility & Account Teams
Formal Planning & Mgt. Control
Accountability Learning
Organization Integration
Data Administration
Data Resource Standards & Controls
Effectively Accountable
Opportunistic & Competitive Applications
Data Resource Function
Data Resource Strategic Planning
Joint User DP Accountability
TIME
Stage I Initiation
Stage II Contagion
Stage III Control
Stage IV Integration
Stage V Data Administration
Stage VI Maturity

into place through a study conducted by IBM staff to determine whether my revised stages hypothesis[2] could be verified with the data from a fairly large number of IBM customers. In addition to confirming Stages I-III phenomena, the study showed my predicted resurgence in DP expenditure growth upon the installation of data base management systems.[3]

Since exposure to the IBM study, further work with several leading-edge companies has led to sufficient data for revision and restatement of the stages hypothesis. This restatement is shown in Exhibit I. Three points are key in understanding this restatement: (1) Organizational Learning and External/Internal Bodies of Knowledge, (2) Balance of Organizational Slack and Control Through the Stages, and (3) Shift from Computer Management to Data Resources Management.

1. Organizational Learning and External/Internal Bodies of Knowledge

Organizational learning and movement through the stages is influenced by the status of the external (or professional) body of knowledge on the management of DP, as well as the status of the company's internal body of knowledge. Exhibit II shows the development of the external and internal bodies of knowledge about how to manage DP. The external body of knowledge is a direct response to developments in information technology. It has to do with the developments in the theory of management of data processing as well as the collective documented experiences of companies. The internal body of knowledge, on the other hand, benefits from the external body of knowledge, but it is primarily an experiential driven body of knowledge that progresses through the stages. It is important to maintain the perspective of the data processing

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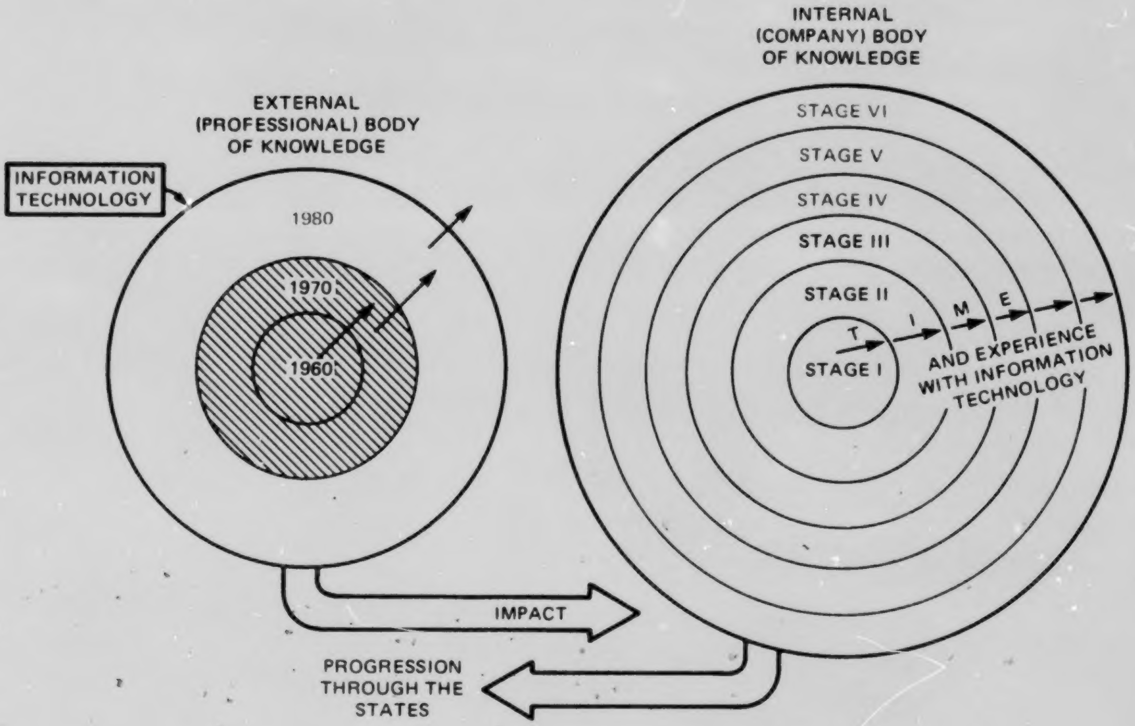
[3] W.M. Carlson Remarks on "Restructuring of the Data Processing Organization for Data Resource Management," A Conference Paper presented by Richard L. Nolan at IFIP Congress '77, on August 9, 1977 in Toronto, Canada.

EXHIBIT II

DEVELOPMENT OF DP BODIES OF KNOWLEDGE
AND MOVEMENT THROUGH THE STAGES


EXTERNAL (PROFESSIONAL) BODY OF KNOWLEDGE
INTERNAL (COMPANY) BODY OF KNOWLEDGE
INFORMATION TECHNOLOGY
1980
1970
1960
STAGE VI
STAGE V
STAGE IV
STAGE III
STAGE II
STAGE I
T
I
M
E
AND EXPERIENCE WITH INFORMATION TECHNOLOGY
IMPACT
PROGRESSION THROUGH THE STATES

technology spurring the development and codification of an external or professional body of knowledge. Exhibit II demonstrates why a company initiating automation of business functions in 1960 moves through the stages differently than a company initiating automation in 1970 or 1978. The information technology is different and the extent of professional knowledge on how to manage the data processing technology is much greater in 1970 than 1960, and much greater in 1978 than in 1970. Not only is the external body of knowledge more sophisticated, but the information technology is more developed.

2. Balance of Organizational Slack and Control Through the Stages

When organizational learning is viewed as a managed process, two environments are balanced—control and slack.[4] In the control environment, all financial and performance management systems—including planning, budgeting, project management, personnel performance reviews and chargeout/cost accounting

---

[4] Richard L. Nolan, Management Accounting and Control of Data Processing (New York, National Association of Accountants, 1977) pp. 22-24.

EXHIBIT III

OPTIMAL BALANCE OF ORGANIZATIONAL SLACK AND CONTROL THROUGH THE SIX STAGES

STAGES	ORGANIZATIONAL SLACK		CONTROL		OBJECTIVE OF CONTROL SYSTEMS
	COMPUTER	DATA	COMPUTER	DATA	
I	LOW	NA*	LOW	NA	NA
II	HIGH	NA	LOW	NA	FACILITATE GROWTH
III	LOW	LOW	HIGH	LOW	CONTAIN SUPPLY
IV	NA	HIGH	NA	LOW	MATCH SUPPLY AND DEMAND
V	NA	LOW	NA	HIGH	CONTAIN DEMAND
VI	NA	HIGH	NA	HIGH	BALANCE SUPPLY AND DEMAND

*Not Applicable

systems are used to ensure that data processing activities are effective and efficient. In the slack environment, on the other hand, sophisticated controls are notably absent. Instead, incentives to use data processing in an experimental manner are present. The incentives come in the form of what Cyert and March call "organizational slack."[5] When management permits organizational slack in the data processing activities, they are committing more resources to data processing than are strictly necessary to accomplish its function. The extra payment achieves another objective nurturing innovation. Nurturing innovation facilitates the penetration of the new technology into the multi-functional areas of the business. When the objective is no longer present or when the benefits of overpayment are not apparent, slack is reduced.

The balance between control and slack is important in developing appropriate management approaches for each stage of organizational learning. For example, an imbalance of high control and low slack in the earlier stages can impede the use of the technology in the organization; and conversely, an imbalance of low control and high slack in the latter stages can lead to explosive DP budget growths of ineffective and inefficient systems. Exhibit III shows the relative appropriate balance of control and slack through the six stages. In Stage III the orientation of management shifts from management of the computer to management of data resources. This shift is associated with the introduction of the data base technology.

3. *Shift from Computer Management to Data Resources Management*

More and more senior and middle managers are becoming frustrated in their attempts to obtain information to support decision-making needs from the company's computer-based systems. Exhibit IV illustrates the late Stage II applications portfolio and helps to explain the root of the problem.

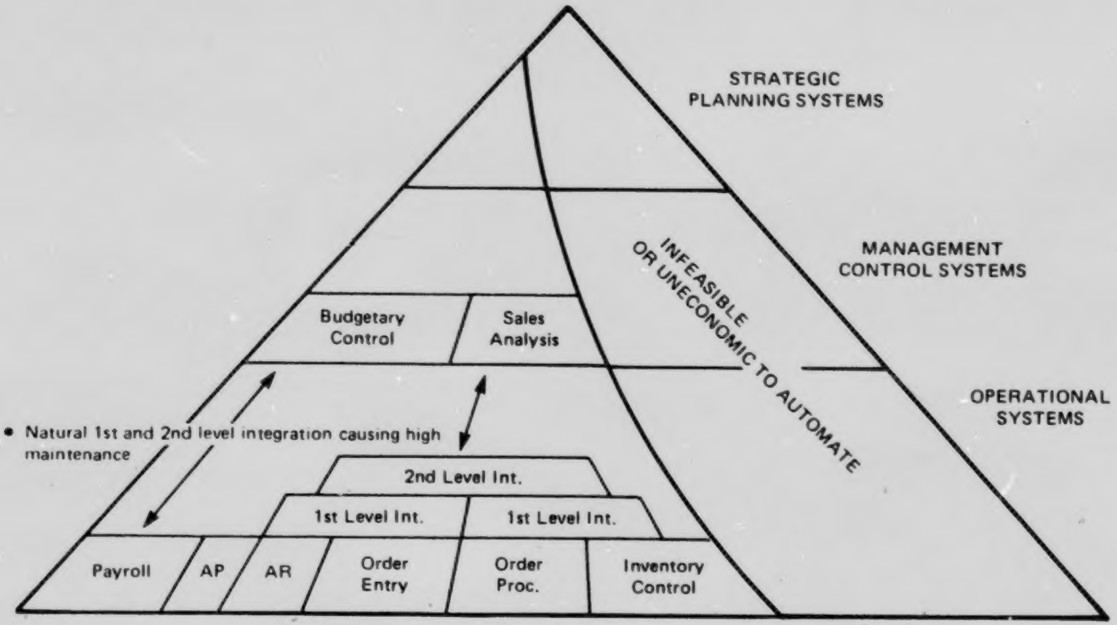
Exhibit IV uses a triangle to illustrate the opportunities for cost-effective use of the data processing technology to support the various information needs in the organization: senior management predominantly uses planning systems, middle management predominantly uses

---

[5] Richard M. Cyert and James G. March, "Organizational Factors in the Theory of Oligopoly," Quarterly Journal of Economics, Vol. 70 (1956), pp. 44-64.

EXHIBIT IV

LATE STAGE II APPLICATION PORTFOLIO


STRATEGIC PLANNING SYSTEMS
MANAGEMENT CONTROL SYSTEMS
OPERATIONAL SYSTEMS
INFEASIBLE OR UNECONOMIC TO AUTOMATE
Budgetary Control
Sales Analysis
2nd Level Int.
1st Level Int.
1st Level Int.
Payroll
AP
AR
Order Entry
Order Proc.
Inventory Control

- Natural 1st and 2nd level integration causing high maintenance
- Poorly designed and documented applications

control systems, and operational management predominantly uses operational systems. Given an information systems technology and the economics of that technology at a point in time, there is a set of information systems which are uneconomic or infeasible to automate.

In Stage I several low-level operational systems in a functional area, typically accounting, are automated. During Stage II, the organization encourages innovation and extensive application of the data processing technology by maintaining low control and high slack. While the widespread penetration of the technology is achieved by expanding into the operational systems, the problems of inexperienced programmers working without the benefit of effective DP management control systems reaches the point of alarm when the applications portfolio base-level systems cannot support higher-level systems (i.e., integrated to support control systems,) and maintenance of the existing relatively poorly designed systems begins to occupy 70-80% of the productive time of programmers and systems analysts.

At this point (sometime in Stage III,) we observe a basic shift in orientation of the data processing management from the mangement of the computer to management of the company's data resources. This shift in orientation is a direct result of analyses on how to restructure the applications portfolio to support integration of operational applications to support management control and planning functions. In addition, it is in response to the need to maintain a degree of flexibility to support management's ad hoc inqueries and unknown future requests for information.

Upon introduction of the data base technology to enable the restructuring of the applications portfolio, there is usually a great deal of soul searching on the appropriate "data administration" control structures to manage the assimilation of the new technology. But there is little effective action. I believe that there is little action because the penetration of the technology is obviously low at its inception, and low control/high slack (see Exhibit III) is the natural balanced environment to facilitate organizational learning. However, this plus a subtle situation in the area of user awareness sows the seeds for a subsequent explosive data processing expenditure growth.

Explosive Stage IV DP Expenditure Growth

Stage III is characterized by rebuilding and professionalizing the data processing activity in order to make it a real part of the organization. It is also characterized by initial attempts to develop a user accountability for the DP expenditures that are caused by the user in support of his/her business function responsibilities. Unfortunately, both the conceptual and technical problems of implementing this user accountability, usually through chargeout of data processing services, confuses and alienates the user community more than it achieves any degree of accountability. Nevertheless, the incorporation of data processing charges into the user budgets is rarely reversed.

Consequently, during Stage III, the user sees little progress in the development of new systems while the data processing department is rebuilding, although being arbitrarily held accountable for the cost of data processing support with little ability to influence the costs. Even the most stalwart users become highly frustrated and in a word "give-up" on data processing.

As Stage III draws to a close, the DP department accomplishes its rebuilding, moves the data base technology into several key application areas such as order-entry, general ledger, and materials requirements planning. In addition, the computer utility and network have reached a point where high quality services are reliably being provided to the users. When these accomplishments are realized, there is a subtle transition into Stage IV.

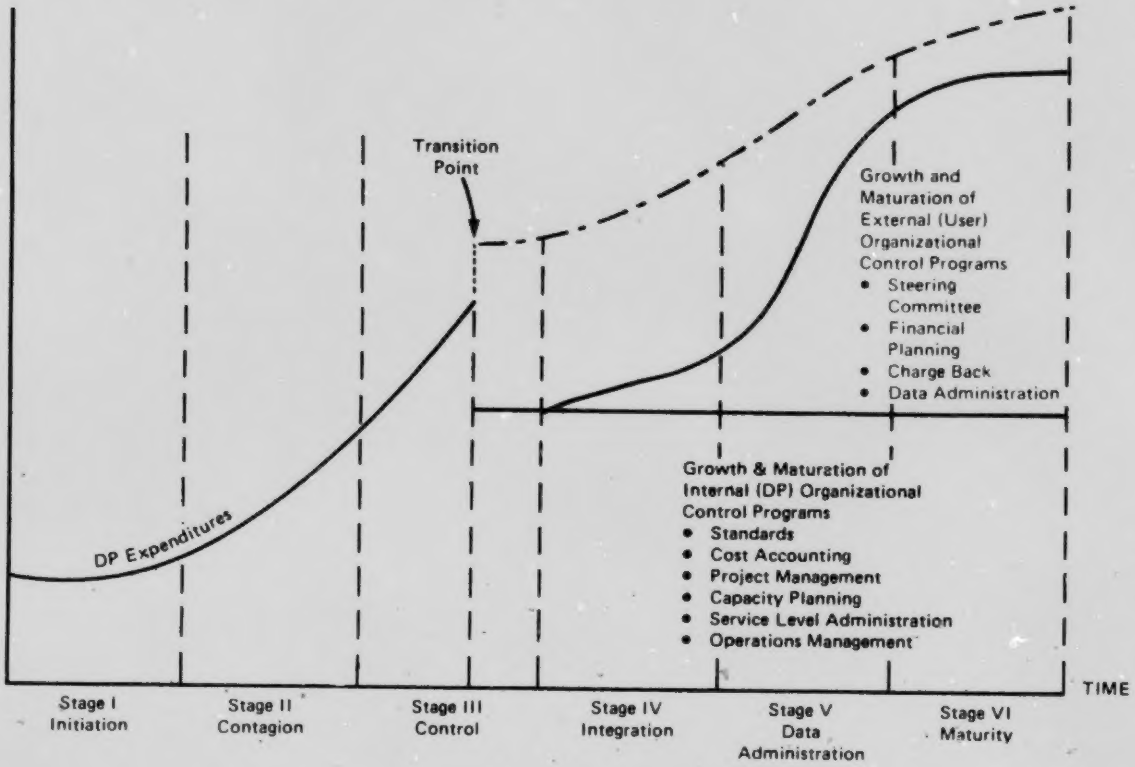
Just when the user has literally given up on data processing as providing anything new, he/she is provided with data base applications support and interactive terminals. The user has already benignly accepted the cost of data processing services. Now real value is perceived and the user community virtually demands increased support and is willing to pay pretty much whatever it costs. This has created data processing expenditure growth rates in a number of leading-edge companies that are reminiscent of Stage II that I thought we would never see again.

It is important to underscore the fact that users perceive real value from the DB/DC[6] applications. In a study in one company of over 1500 applications, users ranked the DB/DC applications by far and away more effective than those using conventional or batch technology. This company has been sustaining data processing expenditure growth rates around 30 percent for the last four years. More importantly, the users are driving this growth rate to the limits of the data processing department's ability to expand. The pent-up user demand of Stage III is part of the reason. But, I believe a more important part of the reason is that the controls put in place in Stage III are designed for internal data processing control rather than external user control. Exhibit V illustrates the typical pattern for the initiation and maturation of internal and external DP control. This becomes apparent by late Stage IV when the inefficiencies of rapid growth begins to inhibit further integration of the applications portfolio. It is at this point, we see the redundancy of data causing problems with the use of control and planning systems leading to a receptive environment to implement an appropriate data administration control structure. Data administration is effectively introduced in Stage V and during Stage VI the applications portfolio is completed and its structure "mirrors" the organization and information flows in the company.

[6] Data Base/Data Communications (DB/DC) refers to data base applications and interactive terminals for data communications.

EXHIBIT V

THE GROWTH OF ORGANIZATIONAL
CONTROL PROGRAMS THROUGH THE STAGES



Benchmarking Your Company's Stage

Much is at stake if your company's data processing stage can be benchmarked to obtain some visibility about the natural growth factors and appropriate management courses of actions. Some workable benchmarks for doing this have been developed. Any one of the benchmarks taken alone could be misleading, but the benchmarks taken together fill in enough of the pieces of the "picture puzzle" to give a reliable image. The purpose of this section is to convey some of the most useful benchmarks.

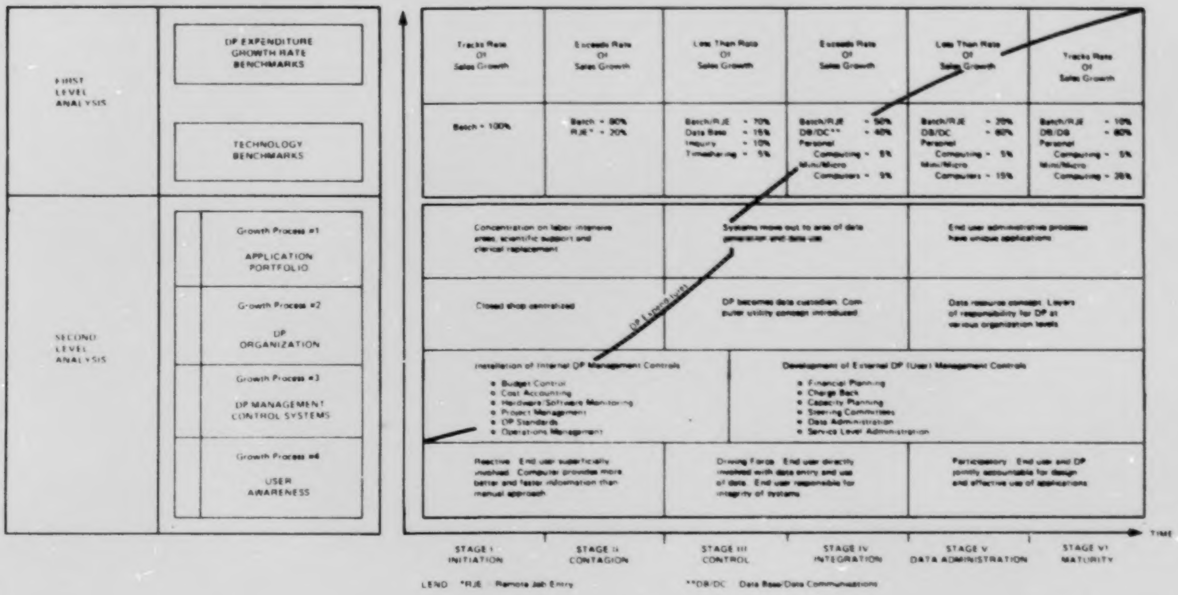
It is important to understand that a large multi-national company probably has divisions simultaneously representing Stages I, II, III, IV, and perhaps V or even VI. However, every company that I have studied has its divisions concentrated in a particular stage. Thus, the particular stage provides the foundation for developing an appropriate DP strategy. Exhibit VI shows benchmarks for identifying a company's overall DP stage.

First-Level Benchmarks

First-level benchmarks involve analyzing the company's DP expenditure curve, observing its shape, and comparing its annual growth rate with the company's sales. A sustained growth rate greater than sales indicates either a Stage II or IV environment. An analysis of Technology Benchmarks will determine whether the

EXHIBIT VI

SIX STAGE BENCHMARKS


FIRST LEVEL ANALYSIS
DP EXPENDITURE GROWTH RATE BENCHMARKS
TECHNOLOGY BENCHMARKS
SECOND LEVEL ANALYSIS
Growth Process #1 APPLICATION PORTFOLIO
Growth Process #2 DP ORGANIZATION
Growth Process #3 DP MANAGEMENT CONTROL SYSTEMS
Growth Process #4 USER AWARENESS
Tracks Rate Of Sales Growth
Exceeds Rate Of Sales Growth
Less Than Rate Of Sales Growth
Exceeds Rate Of Sales Growth
Less Than Rate Of Sales Growth
Tracks Rate Of Sales Growth
Batch = 100%
Batch = 80% RJE* = 20%
Batch/RJE = 70% Data Base = 15% Inquiry = 10% Timesharing = 5%
Batch/RJE = 50% DB/DC** = 40% Personal Computing = 5% Mini/Micro Computers = 5%
Batch/RJE = 20% DB/DC = 60% Personal Computing = 5% Mini/Micro Computers = 15%
Batch/RJE = 10% DB/DB = 60% Personal Computing = 5% Mini/Micro Computing = 25%
Concentration on labor intensive areas, scientific support and clerical replacement
Systems move out to area of data generation and data use
End user administrative processes have unique applications
Closed shop centralized
DP becomes data custodian. Computer utility concept introduced
Data resource concept. Layers of responsibility for DP at various organization levels
DP Expenditure
Installation of Internal DP Management Controls
• Budget Control
• Cost Accounting
• Hardware/Software Monitoring
• Project Management
• DP Standards
• Operations Management
Development of External DP (User) Management Controls
• Financial Planning
• Charge Back
• Capacity Planning
• Steering Committees
• Data Administration
• Service Level Administration
Reactive. End user superficially involved. Computer provides more better and faster information than manual approach
Driving Force. End user directly involved with data entry and use of data. End user responsible for integrity of systems
Participatory. End user and DP jointly accountable for design and effective use of applications
TIME
STAGE I INITIATION
STAGE II CONTAGION
STAGE III CONTROL
STAGE IV INTEGRATION
STAGE V DATA ADMINISTRATION
STAGE VI MATURITY
LEND *RJE Remote Job Entry
**DB/DC Data Base/Data Communications

company is in Stage II or IV. If data base technology has been introduced and 15-40 percent of the company's computer-based applications are operating using data base technology, the company is most likely experiencing Stage IV.

Based upon the International Data Corporation research on the number of companies introducing data base management systems technology in 1977, illustrated in Exhibit VII, I believe that roughly half of the larger companies are experiencing Stage III or IV. This is further corroborated by the same research study that projects the largest percentage growth in the total U.S. EDP budgets in 1978 from $36 billion to $42 billion—a 15½% increase. As shown in Exhibit VII, about 45% of IBM installations will have data base technology installed by 1978 compared to only about 20% in 1976. I believe that this means the explosive Stage IV DP expenditure growth can be expected in the next 2-5 years for most companies, perhaps, somewhat moderated by continuance of the impressive price/performance technological advances.

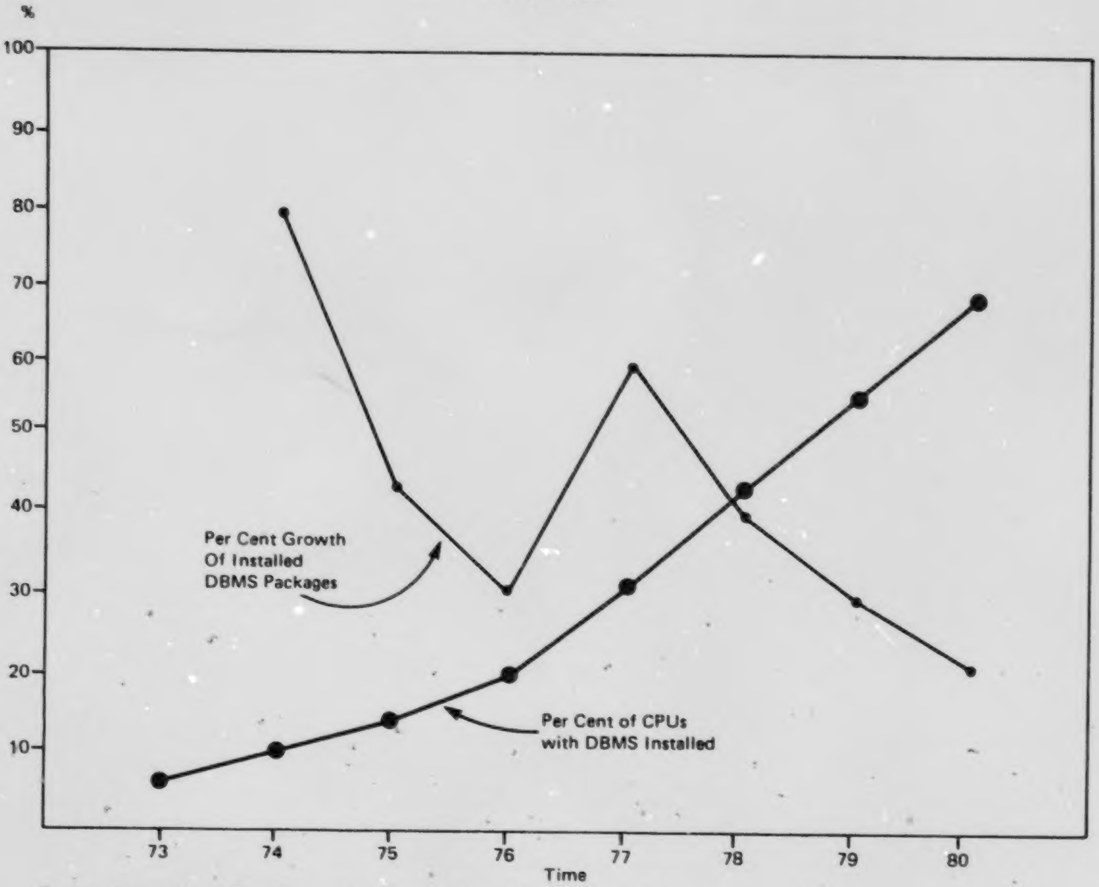
Second-Level Benchmarks

Second-level benchmarks focus on the four growth processes shown in Exhibit VI. Each major organizational unit of the company such as subsidiary, division, or department is identified. Then the growth processes associated with each organizational unit are identified. For example, a decentralized subsidiary would generally have all four growth processes associated with it. A division using the services of a corporate computer utility would only have the applications portfolio and user awareness growth processes associated with it. Once the relevant organizational units are defined, the stage status of each growth process is benchmarked. Although many benchmarks are used, benchmarking the applications portfolio is illustrative of the overall process.

The first step is to define the set of business functions for the organizational unit that represent cost/effective opportunities to apply data processing technology. I call this the Normative

EXHIBIT VII

DATA BASE MANAGEMENT SOFTWARE PACKAGES INSTALLED ON IBM 360/370 COMPUTERS IN THE U.S. 1973 – 1980



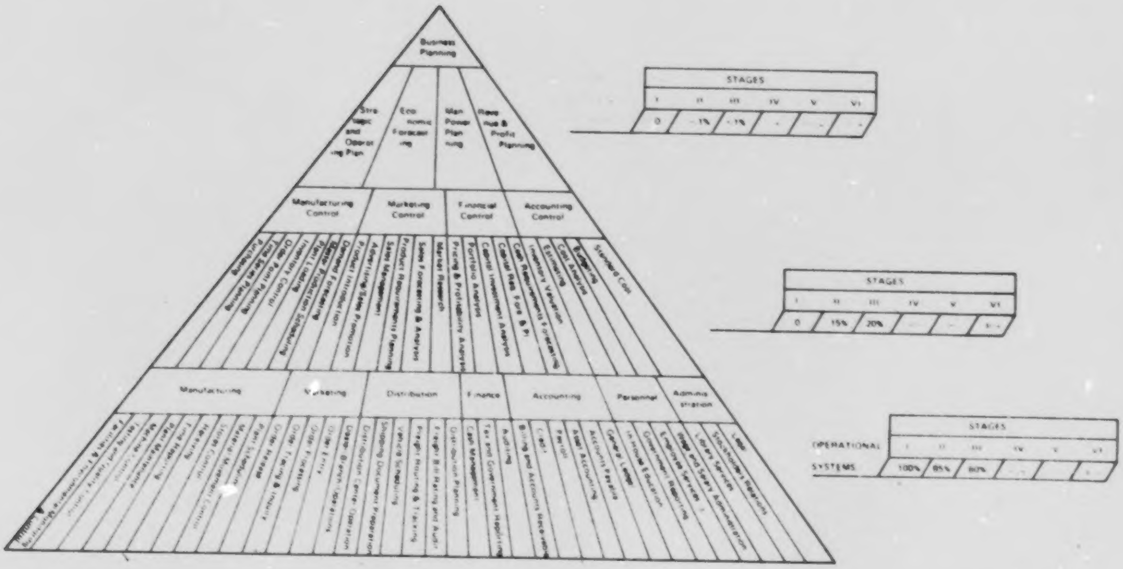
Source: International Data Corporation, Presentation at IDC Conference, "The New EDP Economics," by Richard L. Nolan, April 3, 1978, San Francisco.

Applications Portfolio. It represents the business functions that would be receiving data processing support if the company had achieved Stage VI maturity.

As there is a pattern of providing increased support to business functions, as a company moves through the stages, each function is analyzed. Using a 10 point scale, the degree of functional support is shaded on the Normative Applications Portfolio to give management a picture of "what DP is doing for the business." In broad terms, this picture is placed into a respective stage perspective. Exhibit VIII shows the percentage benchmarks for distribution of total investment in data processing systems to support business functions through the Stages. Next, you should look for data processing investment matching up with the key leverage business functions that contribute to the company's ROI or profitability. For example, if the company's business is manufacturing and half of the data processing system investment goes to supporting Accounting, a red-flag is raised for further investigation.

EXHIBIT VIII

THE NORMATIVE APPLICATIONS PORTFOLIO SYSTEMS INVESTMENT BENCHMARKS


Business Planning
Strategic and Operating Plan
Economic Forecasting
Man Power Planning
Revenue & Profit Planning
Manufacturing Control
Marketing Control
Financial Control
Accounting Control
Budgeting
Cost Analysis
Estimating
Standard Cost
Manufacturing
Marketing
Distribution
Finance
Accounting
Personnel
Administration
STAGES
I II III IV V VI
0 <1% <1%
0 15% 20%
OPERATIONAL SYSTEMS
100% 85% 80%

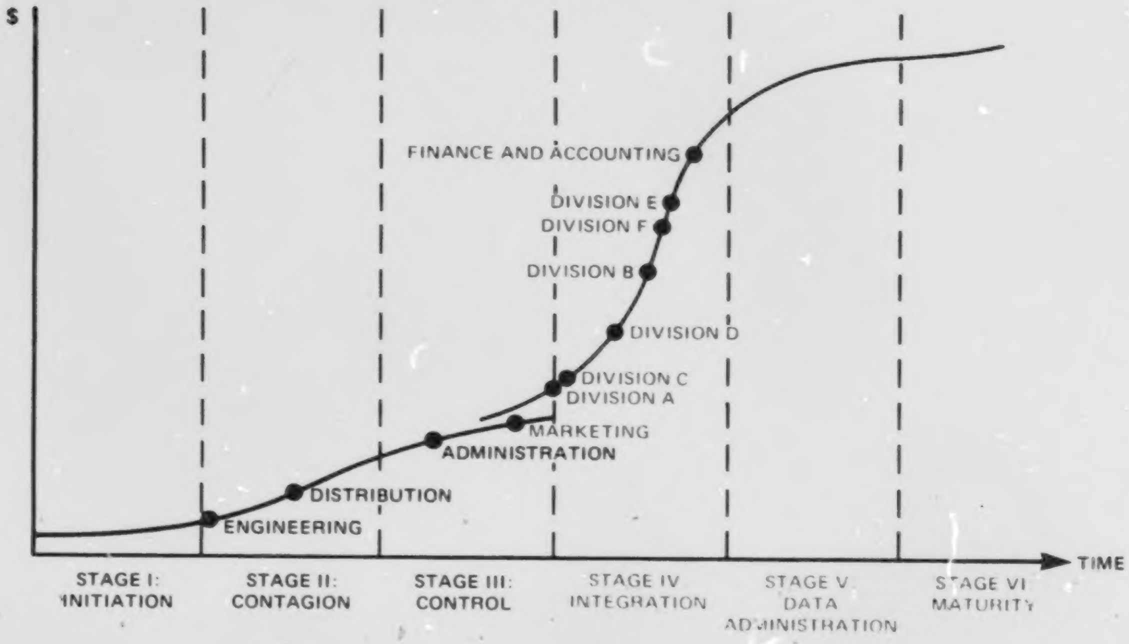
After the functional assessment, you should conduct a "technical assessment" of the applications. The technical assessment gets at the question of whether the data processing activity is using current technology effectively. Benchmarks used include individual system ages, file structures, and maintenance resources required. A similar method using a 10 point scale based upon the functional support provided gives a combined picture of functional support and quality of support. This combined picture helps to "red-flag" situations in which the functional support appears to be good, but is provided at the cost of maintaining a solid up-to-date applications portfolio which would otherwise provide a continued foundation for development—commonly known in business parlance as selling off the company's assets to show profit in the short run.

During the definition and assessment of the applications portfolios for a company, a data processing "chart of accounts" is created. The business functions identified in the applications portfolio are the "objects of expenditures." Creating the DP chart of accounts is an important step in achieving the level of management sophistication required to effectively guide the DP activity through the Stage IV, V, and VI environments.

In a similar manner to the benchmarking of the applications portfolios, second-level analysis is carried out on the other three growth processes. The completion of the benchmarking leads to an overall company stage assessment summary similar to the one shown in Exhibit IX. Identifying the overall company stage and the stage status of the individual organizational units provides the foundation for developing an effective DP strategy.

EXHIBIT IX

**STAGE ANALYSIS OF A COMPANY:
BUSINESS UNITS RUN THE STAGES GAMUT . . .
WHICH CREATES THE NEED FOR A MULTI-LEVELED DP STRATEGY**



Guidelines for Management Action

The data processing activity for most organizations is regrouping for an extremely rapid growth in the next 2 to 5 years. This growth is not necessarily bad; in fact, I believe that if the growth can be managed, it will be the most cost/effective growth experienced to date. Four guidelines can be identified for managing the growth.

Guideline #1: Recognize the fundamental organizational transition from Computer Management to Data Resource Management.

With the introduction of data base technology in Stage III, there is a fundamental manifestation of the transition from an orientation of managing the computer to an orientation of managing the company's data resources. Obviously, this transition doesn't occur all at once. The transition is first most obvious from the analysis of the late Stage II applications portfolio and the requirement to restructure it in such a manner that applications integration can be accomplished. Second, the transition becomes more apparent during the implementation of controls. Difficulties with chargeout systems that are computer-oriented cause searches for alternative ways to achieve user accountability. This often leads to the conclusion that the user can be accountable for the functional support, but DP must be accountable for management of shared data.

The key idea is to recognize the importance of the shift in management emphasis from the computer to data and then build applications and DP planning and control systems to facilitate this transition. Applications should be structured to share data; DP planning should be data oriented as should the DP controls.

Guideline #2: Recognize the Importance of the Enabling Technologies.

The emerging information technologies are economically enabling companies to manage data as a resource. It is important to underscore the word economically. What companies did only a few years ago in establishing large central data processing utilities is no longer justifiable by economic arguments. Data resource management arguments are now the relevant ones.

Data base technology is important from an organizational standpoint. It enables the company to implement the data resource management concept. Developments in large computer technology is making new and exciting data structuring techniques economically feasible. These techniques are exciting from the standpoint of new approaches to management control and planning. They also open up new opportunities for doing business differently at the operational level.

Data communications through terminals, and micro/minicomputers technologies are resulting in networks that tie the business closer together. From a data resource management perspective, the location economics of data is being vastly improved.

Guideline #3: Benchmark your company's stage and the company's operating units stages and use as a means for keeping the data processing activity on track.

A basic management tenet is "If you can't measure it, you can't manage it." The applications portfolios of a company provide data processing with a chart of accounts. To date, in the data processing profession, we have not had a generic and meaningful way to describe and track a data processing activity. The Stages Theory is a generic and an empirically supported descriptive theory on the evolution of the data processing activity. As such, we can use it to understand where we have come from and which problems were a result of weak management and which of natural growth. More importantly, we can gain some visibility into what the future might hold, and then try to develop appropriate management strategies that will effectively negotiate a course to where we want to go.

Guideline #4: Develop a Multi-level DP Strategy and Plan.

Most data processing departments have matured out of their earlier "cottage industry" era. They have reached the point where they are woven into the operating fabric of their companies. There are many documented cases of the important impact that a computer failure of mere hours can have on a company's profitability.

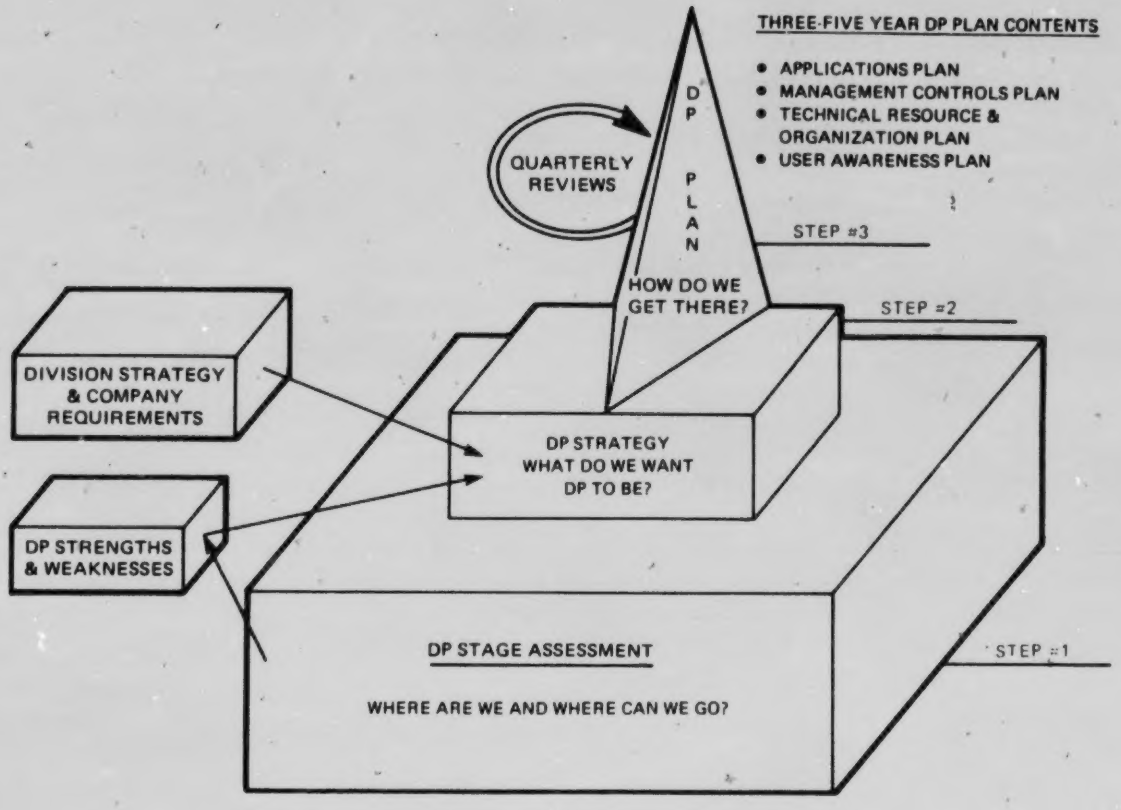
Nevertheless, many data processing departments continue to hold onto the "cottage industry" strategy of standing ready to serve any demands that come their way. This can have a disastrous effect when Stage IV begins to run its course. The extent and complexity of the activity makes it impossible for data processing to be "all things to all users." Consequently, decisions will have to be made on "what data processing will be." If the data processing management makes these decisions without benefit of an agreed upon DP strategy and plan, the decisions are apt to be wrong ones; and, more importantly, even if the decisions are right, the rationale for them will not be adequately understood by user management. If user management does not understand the strategic direction of the DP activity, they are unlikely to provide support.

Development of an effective DP strategy and plan is a three step process. The Stage Assessment is the first step. It determines "Where the company is in the use of data processing." More importantly, DP strengths and weaknesses can be analyzed to determine feasible 3-5 year DP strategies. Deciding on a feasible DP strategy is Step Two. The DP strategy should "fit" the company's Business Strategy. This is shown in Exhibit X.

Step Three is the development of the DP Plan for the next 3-5 years. As shown in Exhibit X, the DP Plan should include detail plans for each of the four growth processes. It is important to recognize that the DP Plan resulting from this three step process is an entry-level, or first, plan for most companies. Thus, the plan cannot and

EXHIBIT X

STAGE ASSESSMENT/STRATEGY FORMULATION/PLAN DEVELOPMENT IS A THREE STEP PROCESS


THREE-FIVE YEAR DP PLAN CONTENTS
• APPLICATIONS PLAN
• MANAGEMENT CONTROLS PLAN
• TECHNICAL RESOURCE & ORGANIZATION PLAN
• USER AWARENESS PLAN
QUARTERLY REVIEWS
DP PLAN
HOW DO WE GET THERE?
STEP #3
STEP #2
DIVISION STRATEGY & COMPANY REQUIREMENTS
DP STRATEGY WHAT DO WE WANT DP TO BE?
DP STRENGTHS & WEAKNESSES
DP STAGE ASSESSMENT
WHERE ARE WE AND WHERE CAN WE GO?
STEP #1

should not be too detailed. It should provide the appropriate "blue-print" and goal set for each growth process to move the DP activity toward support of the Business Plan. It should also "spark" the DP planning process—a process that will improve with each year of experience.

Guideline #5: Make the Senior Management Steering Committee Work.

The Senior Management Steering Committee is an essential ingredient for effective use of data processing in the advanced stages. It provides direction to the DP strategy formulation process and guidance for necessary re-prioritizing of DP plans to keep them on track.

Quarterly Reviews or meetings seem to have worked out most successfully for Senior Management Steering Committees. This gives enough time for progress to be made in the data processing activity as well as allowing close enough monitoring for key issues to be resolved. Plan progress and variances provides the basis for a relevant Quarterly Review agenda.

GENERAL SESSION

WEDNESDAY LUNCHEON ADDRESS

John D. Wilson
Provost
Virginia Tech

INSTITUTIONAL PERSPECTIVE FOR THE 80's

Dr. Wilson talked informally about his perception of some of the implications of technological change. He conceded, for example, the humanist's sense of the irony of our having joined a vast capacity for language processing with what appears to be a growing contempt for the authority of language in human moral and intellectual development. He also discussed the implications of computer development for higher education management in the years ahead.

GENERAL SESSION

Vinod Chachra presents a gift of appreciation to CAUSE 79 Chairman Charles H. Naginey.

Vinod Chachra presents a certificate of appreciation to outgoing Editorial Committee Chairman Jerry Magnuson.

Charles Naginey presents Track III Coordinator Donald F. Tiernan his plaque of appreciation.

THURSDAY LUNCHEON

Program Chairman Charles Naginey presented tokens of appreciation to the members of the Program Committee and the Registration Staff. CAUSE President Vinod Chachra introduced the new members of the Board of Directors and the new officers. Retiring Board members were awarded Certificates of Appreciation.

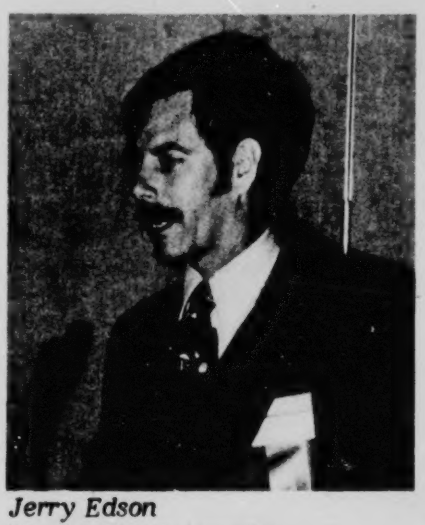
Fran Brauer, registration worker, receives a little more than just a gift of appreciation from Charles Naginey.

Outgoing CAUSE President Vinod Chachra (left) presents the gavel to newly-elected President Joseph A. Catrambone

VENDOR PARTICIPATION

Participation of the following companies in the 1979 CAUSE National Conference is greatly appreciated.

Arthur D. Little Systems, Inc. (ADLS)
IBM Corporation
Informatics, Inc
Information Associates, Inc. (IAI)
Integral Systems, Inc. (ISI)
Management Science America (MSA)
National Computer Systems (NCS)
Pansophic Systems, Inc.
Systems and Computer Technology (SCT)



Jerry Edson
Vanderbilt University

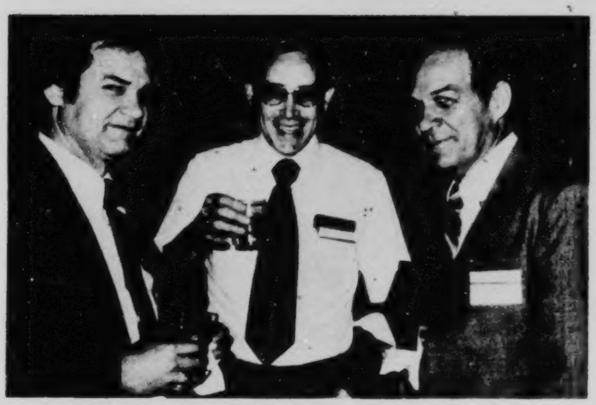
Bill D. Morris
University of Central Florida

Michael Gauthier
Arthur D. Little Systems, Inc.

John Lattig
IBM Corporation

REGISTRATION RECEPTION

TUESDAY EVENING, NOVEMBER 27



TRACK I
MANAGEMENT AND INFORMATION SYSTEMS

Coordinator:
Dorothy J. Hopkin
University of Illinois

Ronald W. Brady
University of Illinois

Jerry W. Brown (left)
Rider College

Allan Service
Patrick Linnane and Associates

Charles H. Bryson
Georgia State University

Management and Technology in Higher Education in the 1980's

by

Ronald W. Brady
Vice-President for Administration
University of Illinois

Rapidly changing technology provides new opportunities for management to respond to the issues of the '80's in higher education. Decisions with regard to computer capability, networking and distributed processing are key. Large, sophisticated systems, centralized data control, high-capacity hardware, and distributed processing are in use at University of Illinois, and data exist to demonstrate increased administrative productivity as a result. Each institution must arrive at a plan that fits its needs, balancing centralization with individual initiative, hardware and software options with traditional management needs.

General Remarks

The 1980's will be, almost without debate, a period of time in the developmental history of higher education administration characterized by a host of management problems.

The often discussed issues of enrollments, inflation, energy, collective bargaining, tax resource constraints, increased accountability and decreasing purchasing power will continue to dominate the discussions of higher education administrators for some time. These concerns are, generally speaking, problems for managers more than for educators, although the two are not mutually exclusive. These areas are different, however, than the issues of the 1960's or 1970's when access and growth, programs and new campuses were foremost in our minds and in our time for planning and review.

These problem areas will require a great number of imaginative and innovative responses if the quality of our universities is to be sustained during these next few years. Any one of the problem areas could easily consume the time for discussion here, and a partial solution for each may be possible through some forms of technological improvements.

Many technological developments from a number of different fundamental disciplines give hope for future cost containment or service improvements. New medical/engineering developments can contribute to better health care and even longevity. Developments in new energy sources can help with the incredible escalation of energy costs. Almost daily evolutions of the micro-electronics industry expand horizons in every area of academic and administrative departments.

The subject of this discussion is, however, a much more restricted case of management and technology. Our subject matter today is the management of information systems, and our technology is largely a combination of computing capability, communication networks and systems. The management issue of that of planning, organizing and bringing to life the resources to accomplish certain objectives. The management task is administrative in nature and can be improved through the technology we often call data processing.

To the irritation of some of my colleagues at the University of Illinois and the delight of others, I insist on calling our data processing organizational units by some permutation of the title Administrative Information Systems and Services, AISS.

The University of Illinois has made a major commitment to the development of this technology through the establishment of a large organization across the entire University. I am going to spend a few minutes describing our organization, both people and hardware, and then I am going to discuss how in several specific cases, the use of the systems created by the AISS organization supports management initiatives and administrative productivity.

Total expenditures for administrative data processing for FY79 were \$9.429 million or about 1.6% of the total University operating budget of \$570.8 million. The components were:

Salaries & Wages	\$ 5.040	53.5%
Hardware & Software	3.131	33.2%
Supplies & other	1.258	13.3%
	\$ 9.429	100.0%

The university office of Administrative Information Systems and Services is organized as shown by the organization chart called Exhibit I. The complexity of the organization is due primarily to the need to accommodate not only a multi-campus university, but also to respond to the objective of a single university-wide plan with certain university-wide systems as well as unique campus needs. We began creation of this organization in 1972, when we had four different and distinct ADP centers. Basically, there was a computer facility at each campus, with one additional computer at our Medical Center doing some hospital work and some research and instructional type support. A University Office coordinated management and systems development.

A decision was made, not without differences of opinion, that we would consolidate into one single center with RJE capabilities at each needed location--campus or otherwise. We believed then and now that the technological developments to come were going to support data communications, data base systems and distributed computing. That was the technical justification. We also believed it essential to manage the information systems development centrally for common systems: we defined the Financial Data System and the Personnel Data System to be common, university-wide systems. We also concluded that data base administration was a function which needed to be managed to assure consistency and ultimately provide a source of management-oriented inquiry. We also believed that each campus had unique needs for student data systems and local support systems, such as hospitals in the case of the Medical Center or residence halls in Urbana.

We have, therefore, created a dual responsibility for campus AISS centers: they are responsible to the Associate Vice President for Administrative Information Systems and Services with respect to hardware, software, data communications, and university-wide systems implementation and production; they are responsible to their respective campus Vice Chancellors for campus application development, maintenance and production.

To oversee differences of opinion we have created an AISS Council that either reconciles issues or brings them to me.

This organization has 311 FTE employees in FY79, broken down as follows:

	FTE	%
Management	15	5
Systems Analysts	84	27
Application Programmers	59	19
Systems Programmers	18	6
Computer operations	44	14
Clerical, etc.	91	29
	311	100%

These people are assigned roughly 16% Chicago Circle AISS, 25% Medical Center AISS, 34% Urbana AISS, and 25% General University.

The functional breakdown is:

Development	26%
Maintenance	28%
Production	34%
Administration	12%
	100%

We do not expect to see significant change in this functional activity over the long term.

Based on the percent of total usage, the computer usage as determined by accounting units shows where we are in FY79:

	Batch	TP	Total
Medical Center	33.7%	9.5%	43.2%
Urbana	23.8%	6.1%	29.9%
Circle	11.6%	4.7%	16.3%
General University	9.4%	1.2%	10.6%
	78.5%	21.5%	100.0%

The computer in use during this time was essentially an 8 MB 370/168 Mod. 3.

At this moment we have a second 370/168 installed in an MP configuration. There are two extremely large TP systems in development which will change the percentages of batch and TP dramatically. I shall describe these two systems later.

The extremely high usage at the Medical Center is attributed to hospital patient accounting and other related hospital support systems and, since one of the two new major systems is a 350 terminal Technicon Medical Information System, the Medical Center usage of the MP-168 hardware will actually increase.

One note before we go on to other issues: the system reliability during FY79 was in excess of 98% for subsystem availability with a mean-time-between-failure of about 4 days. This extraordinary system availability has led to confidence on the part of users, which in turn has allowed us to plan for even more technological developments in an atmosphere of calm and reason.

On the Subject of Productivity

One of the most important and difficult issues for the future (as well as the present) in the development of information systems and services is that of cost. We are clearly in a period of time where resources are being constrained by tax reform and purchasing power is being eroded by inflation. We all know that computing grows less expensive with each new generation of hardware on a per instruction executed basis. In fact, the cost for MIPS has declined two orders of magnitude in less than two decades, and most estimates indicate that this exponential curve will continue. It is also clear that the computer-on-a-chip technology will continue to provide opportunities that will amaze even the most far-sighted of us.

Is it possible to use this technology not just to astound ourselves with gadgets, but to affect administrative productivity?

So many complicated measures as well as arguments on this subject are available, that one may argue on this subject as one chooses. I, however, have chosen to look at the issue in a global, "bottom line" way. I look at our total Administrative and General budget as a percent of our total budget. When A&G goes down as a percentage, I argue that the reduction means better productivity, assuming of course, that the quality remains constant.

We began our major expansion in data processing about 1972. 1971 was the last base year when ADP was a local, campus-based, rather traditional activity. In FY71, the total budget of the University was $311,184,711. The A&G budget was $23,700,052: this was 7.62% of the total. ADP was a budget of $4,862,000 or 1.56% of the total and 20.5% of A&G. The number of CPU hours produced in that year in 370/155 equivalents was 626.

In FY79, the total budget of the University was $570,840,597. The A&G budget was $28,680,271: this was 5.02% of the total. ADP was a budget of $9,170,000 or 1.61% of the total and 32.0% of A&G. The number of CPU hours produced in that year in 370/155 equivalents was 7,040.

The compound rates of growth (1971-1979) tell a fascinating story:

Total Budget	7.88% per year
A&G	2.41% per year
ADP	8.25% per year
CPU hours	35.32% per year

Clearly the increase in CPU hours is not the single variable that has allowed A&G to be held down. Any of our administrative units that has experienced a lid on new programs and has had to respond to enormous increases in paperwork will tell you that people are also more productive and that many devices like copiers and mag-card typewriters and electronic cash registers have produced gains perhaps even in excess of terminals and computer products. Also, equally clearly, the measure being used (A&G as a percent of total) when applied to productivity, has inherent deficiencies, many of which are fairly obvious. However, the data processing productivity is not subject to many conceptual or measurement problems. In 1971, we produced 626 370/155 equivalent CPU hours at an overall (hardware/people/supplies) cost of $7,766 per hour. In 1979, we produced 7,040 370/155 equivalent CPU hours at an overall cost of $1,302 per hour. Assuming we can use the outputs effectively, we have clearly increased productivity.

Let me now discuss several large systems supported by this expansion which exemplify the notion that this capability is useful.

University-wide Computer Applications

At the University of Illinois, two sophisticated TP systems are taking over data processing in areas long overburdened by manual systems: library and hospital management. By July, 1980, all the University of Illinois libraries will circulate materials and patron notices, and keep statistics and patron files on the on-line Library Computer System (LCS). By July, 1981, departments and functions* of the new 500-bed University of Illinois Hospital will be supported by the on-line Technicon Medical Information System (TMIS). These systems will run on the MP-168.

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*with the exception of historical medical records.

LCS This system was developed at The Ohio State University, and adopted for use at the University of Illinois in 1977. Adaptations have been and continue to be made, to fit the system to the needs of UI. The libraries of the University will have completed conversion of their shelf-lists (2,315,405 records) to machine-readable form this spring. In addition, fourteen other academic libraries in the state, public and private, will have their records (approximately 2,521,000) converted, equipment and lines installed, and be ready to use LCS by the end of 1980. The 18 state regional libraries will also be members of the system with search and borrowing privileges.

Four hundred terminals will be in use, primarily by library staff. Additions; edits; searches by title, author, or catalog number; patron information and notices; and circulation statistics will be available from the system. Materials may be checked out or renewed by telephone at some sites.

Batch processing is done when LCS comes down each midnight. Patron notices are produced, and at least 90% of data maintenance and any needed program maintenance are performed.

Initially, LCS was to serve only the University of Illinois libraries, and was running on a 360/75 at one campus. However, encouragement and funding from the state (with support from Illinois Board of Higher Education) permitted us to plan for, justify and acquire larger computer capability and extend services to the libraries of more institutions. The transfer from one machine to the other is taking place without interruption of extant UI library service and with additional service gradually being undertaken for other schools. I need not underline the exhaustive planning required to produce this situation.

Considerable effort in training precedes the use of LCS by a library--programmers and librarians must learn enough about their respective metiers to talk to one another usefully in the development stage; people must be trained to proof and edit the large data base; staff must be trained to use the system; and patrons must be educated in search techniques. Much of the training was on-the-job, and one library learned from another. The University has established a coordination center for advice and information sharing to help non-University libraries make the transition to LCS. The ultimate development should lead to FBR (Full Bibliographic Record), coordinated acquisitions and even to storage systems.

TMIS The University purchased from Technicon Corporation the structure of TMIS, along with access to specific applications in other hospitals and the services of an implementation team. TMIS is an order-communication-reporting system which handles financial management (patient billing and hospital financial management), admitting, nursing, medical staff and departments, pharmacy, laboratory, radiology, clinics and other ancillaries, as well as providing information for reports to outside agencies.

Change and development in both application and hardware are necessary to fit the system to the University of Illinois Hospital. Mandatory changes in the drug formulary, types of tests, and billing for Medicare and Medicaid patients reflect the hospital's unique academic environment, range of services and patient mix, Other developmental work will relate the system to the organization of University and hospital departments and to the geographical and organizational decentralization of the institution. Lastly, some application changes are being made to incorporate automated systems now used in the hospital.

The system is being phased in over 18 months. Continued refinements and changes will be made long after it is up, as part of the plan to provide the best service. The completed system will have 350 terminals and printers at approximately 150 sites (500 miles of cable) on the Medical Center Campus.

TMIS was originally designed to run on a self-contained hospital data-processing system, with equipment now several generations old. The University Hospital is comparatively large and sophisticated, part of a very big university, and has access to a larger, more complex computer. As a result, Technicon and UI are doing some significant work to change the environment and the system. TMIS was originally written for DOS running on a 370/155. The 168 does not support native DOS, so for the short term we are taking one of our 168's and running DOS under VM. Most of TMIS is then brought up in this environment. For the long term, the University and Technicon are developing an interface so programs can run under MVS or any similar system, rather than DOS, a fairly unusual arrangement.

TMIS at the University is an extremely complex system, and its development to fit our requirements involves participation by a broad spectrum of our staff: nurses, doctors, administrators of all kinds, pharmacists, laboratory personnel, academics, data processing staff. Three committees--policy, user/coordinating and technical--have been established to work on implementation, and each user group has its own task force (approximately 15 task forces). A sophisticated, thorough training effort has been launched, to sell the system at a general level and to train specific groups of users. Both Technicon and UI staff are preparing training.

These two major new systems, I believe, characterize the developing use of this technology. They are not the only such large scale systems in use in higher education. For example, the University of Illinois, like a number of other universities, is engaged in the development of an entirely new financial management system which, when (if ever) completed, will touch almost every corner of the University in fundamental ways. And one of the underpinning design requirements is administrative productivity. The system sets that objective for departments and source data as well as for all reporting, accounting and planning.

The Future

It seems to me, based upon all the information available, that the future will be, or can be, a continuation of the last several years. The cost of computing continues to decline with respect to data stored or instructions executed. As the use of the capability is distributed through networks and communications systems, the cost beneficial applications increase. More use will be viable for electronic mail, teleconferencing, talking to computers, information retrieval, and for many of the kinds of uses heretofore restricted to applications of extreme volume or located near computer or copy centers.

The basic question as I see it is not _if_ technology can be used to improve administrative productivity, but how to move forward incrementally in implementation.

The specific answer, I suspect, is more an individual institution's decision, and rightfully so, than any generic scheme. Institutions are different in many significant ways, and the politics of change are as important as the economics.

I believe, however, there are some principles which might be considered with respect to this concept. First, my experience has led me to believe that some leadership and imagination are necessary. Successful organizations of all kinds, including educational institutions, are characterized by vision, by being ahead of changing circumstances. Often, if one waits for a technology to be proved by demonstrated cost/benefits before proceeding with development, the particular process in question approaches obsolescence before it can be successfully applied. Conversely, the simple availability of a new device or gadget does not in and of itself constitute evidence to justify acquisition or implementation. The decision process therefore largely hinges upon judgments about the future.

A second point, in my judgment, is that there must be a judicious balance of planning and control with entrepreneurship and experimentation, a difficult position to manage. Most people seem to fall in one camp or the other, and a great deal of effort is expended arguing over or protecting one's point of view. There are great pressures to centralize planning, control and sometimes operations of computing centers. In many states this pressure has caused state government to become involved in such activities. Good arguments exist in support of this position. The concepts of centralized evaluation, standardization, compatability, reduction of redundancy, training, financing and planning are sound in theory; the outcomes are often less useful than that theory implies because of the efforts of bureaucracy. Individual initiatives and experiments can enhance evaluation of alternative systems and often induce breakthroughs in software or systems that advance the state of the art.

However, too much independent exploration brings management and certainly state agencies to perceive the activity as unorganized and therefore suspect.

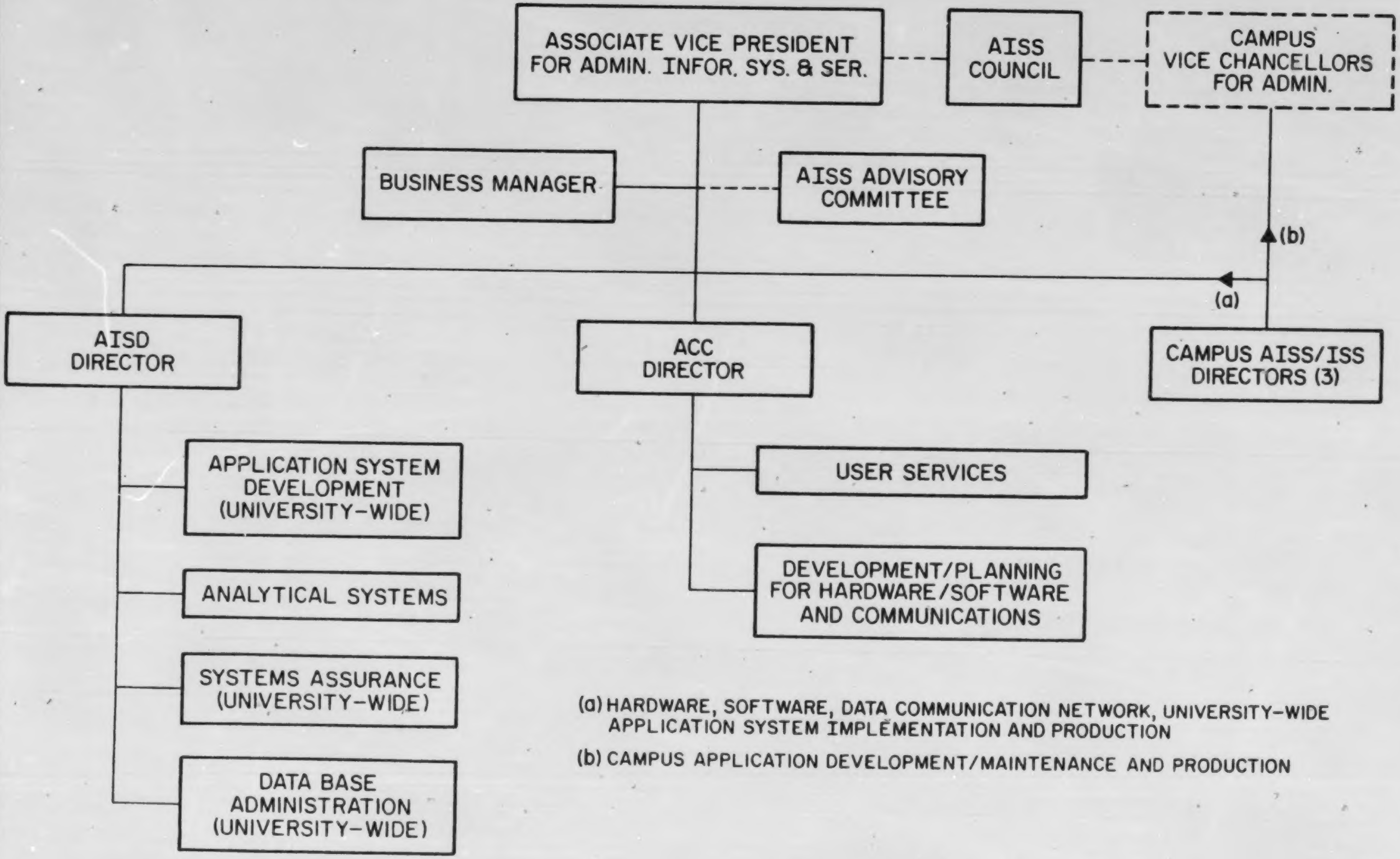
In my judgment, with respect to this issue, management should overtly consider a reasonable balance between these two positions. Included in this compromise relation are such issues as mini/micro processors, word processors and advanced copying machines. In different words, I believe one cannot control all related technologies centrally or initiatives will be stifled and cost-effective systems missed. Nor can one ignore central planning and review, or confusion and redundancy will reign.

My final principle for consideration is another judicious combination, patience and persistence. I like to talk internally of an accomplishment-to-friction ratio. If one pushes too fast the friction brings up the heat and the price for accomplishment is too high. Even more important, the perception of benefits goes down when the heat goes up, causing the value of the accomplishment to go down. This combination of events can bring the value of the accomplishment-to-friction ratio very close to zero. Curiously, this measure has different values at different times in different organizations, depending on a wide range of issues and personalities. Each organization needs to find a process whereby the value of this ratio can be sensed and managed.

In closing, let me repeat that I believe we have measurable and demonstrable evidence that the productivity of administration can be improved by using data processing technologies in university applications, even though one can argue about the best measures and speculate about concepts such as improved decision making. I also feel strongly that all the traditional functions of management planning, organizing and controlling are necessary to manage the technology. I do not believe that somehow technology as an independent concept will improve management. And finally, since I am convinced that the next decade will bring us a host of management problems, I believe that we will without question see more developments and uses than we see today.

Exhibit I

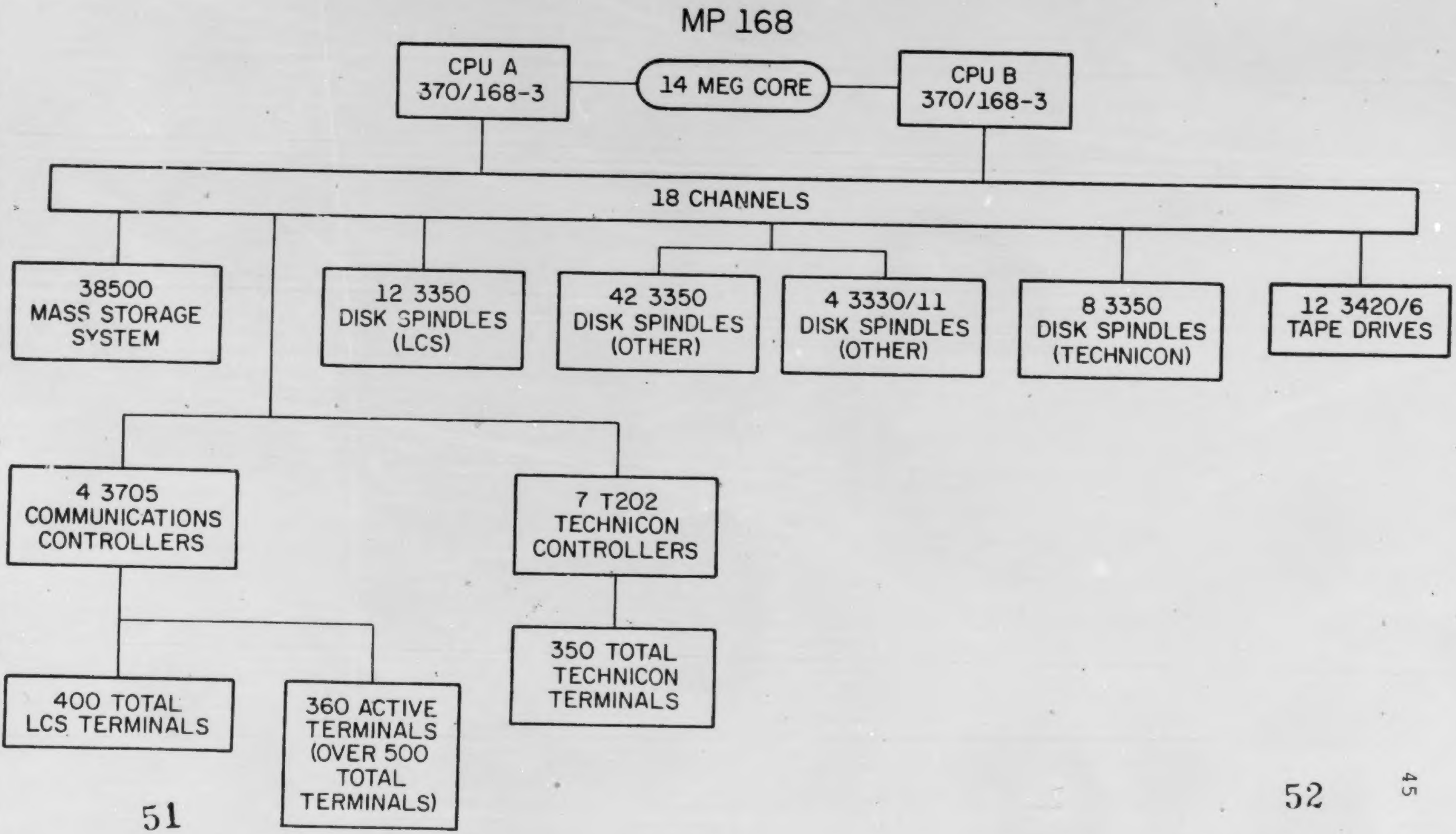
UNIVERSITY OFFICE OF ADMINISTRATIVE INFORMATION SYSTEMS AND SERVICES


ASSOCIATE VICE PRESIDENT FOR ADMIN. INFOR. SYS. & SER.
AISS COUNCIL
CAMPUS VICE CHANCELLORS FOR ADMIN.
BUSINESS MANAGER
AISS ADVISORY COMMITTEE
(b)
(a)
AISD DIRECTOR
ACC DIRECTOR
CAMPUS AISS/ISS DIRECTORS (3)
APPLICATION SYSTEM DEVELOPMENT (UNIVERSITY-WIDE)
ANALYTICAL SYSTEMS
SYSTEMS ASSURANCE (UNIVERSITY-WIDE)
DATA BASE ADMINISTRATION (UNIVERSITY-WIDE)
USER SERVICES
DEVELOPMENT/PLANNING FOR HARDWARE/SOFTWARE AND COMMUNICATIONS

(a) HARDWARE, SOFTWARE, DATA COMMUNICATION NETWORK, UNIVERSITY-WIDE APPLICATION SYSTEM IMPLEMENTATION AND PRODUCTION

(b) CAMPUS APPLICATION DEVELOPMENT/MAINTENANCE AND PRODUCTION

UNIVERSITY OF ILLINOIS
PROJECTED COMPUTER CONFIGURATION
JULY, 1980



MP 168

CPU A
370/168-3

14 MEG CORE

CPU B
370/168-3

18 CHANNELS

38500
MASS STORAGE
SYSTEM

12 3350
DISK SPINDLES
(LCS)

42 3350
DISK SPINDLES
(OTHER)

4 3330/11
DISK SPINDLES
(OTHER)

8 3350
DISK SPINDLES
(TECHNICON)

12 3420/6
TAPE DRIVES

4 3705
COMMUNICATIONS
CONTROLLERS

7 T202
TECHNICON
CONTROLLERS

400 TOTAL
LCS TERMINALS

360 ACTIVE
TERMINALS
(OVER 500
TOTAL
TERMINALS)

350 TOTAL
TECHNICON
TERMINALS

COMPUTING SERVICES IN THE 80's: BLUE SKIES OR GRAY?

by

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Media, Pennsylvania

and

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Systems & Computer Technology Corporation
Malvern, Pennsylvania

From interviews with computer center directors in a selected sample of public and private two-year, four-year, and university level institutions, findings related to MIS issues for the 1980's are addressed. Anticipated areas and directions for change which are discussed are personnel, budget, management, and governance. The information from this study should be a good starting point for you to begin such an assessment at your institution.

SURVEY TITLE: Computing Services in the 80's: Blue Skies or Gray?

PURPOSE:

(1) To determine the estimated level of computing support in the 80's.

(2) To compile data which could be used for planning by college and university computer personnel.

SAMPLE: Twelve postsecondary institutions from the eastern United States arrayed by private and public across two-year, four-year, and graduate institutions.

PROCEDURES: A twelve item survey was developed by Richard Spencer and Larry Craft with suggestions by professional researchers from Delaware County Community College and Systems & Computer Technology Corporation. The survey was used as the basis of a comprehensive telephone interview with chief officers of the data processing centers at the selected institutions. All surveys were completed between 9/15/79 and 10/15/79 by the authors. Anonymity was promised to all respondents.

RESULTS: Results are summarized beginning on page 3. They are reported by question in matrix form with further observations drawn.

CONCLUSIONS:

(1) There will be more dependency on computing in the 80's than in the 70's.

(2) Four-year institutions had largest budget increases during the 70's.

(3) Dollar growth rate for the 80's is not expected to match that of the 70's.

(4) More of the computing budget will be spent for people during the 80's than in the 70's.

(5) There will be a real use of computing resources in the 80's.

(6) Professional computing salaries will continue their current increases, thus contributing to faculty unrest.

(7) Computer centers see a need for different reporting relationships but find it will be difficult to achieve.

(8) There will be an overwhelming array of products which will create the need for special workshops to keep abreast of the state-of-the-art.

(9) Computing will be brought to the "masses" and used by the "masses."

(10) Private two-year colleges seem to be in their infancy in using computers.

COMPUTING SERVICES IN THE 80's: BLUE SKIES OR GRAY?

1. Will computing services in the 80's be significantly different than those in the 70's?

	PRIVATE	PUBLIC
TWO-YEAR	Data Processing has not made any initial impact in this environment.	No. Evolution to on-line and away from centralized hardware.
FOUR-YEAR	Interactive use.	More time-sharing; computer centers will become communication centers.
UNIVERSITIES	Time-sharing; user focused and tailored.	Changing technology will bring about more hardware affordability.

GENERAL OBSERVATIONS: The interviews suggest more dependency upon computing with a definite trend toward interactive use. Data Processing will become routine for the present non-technical users and student usage will take a quantum leap.

COMPUTING SERVICES IN THE 80's: BLUE SKIES OR GRAY?

2. Has the decade of the 70's prepared us adequately for the decade of the 80's?

	PRIVATE	PUBLIC
TWO-YEAR	Not using current, let alone new technology.	Not prepared for data management and security issue (privacy). Materials are available for transition for those willing to use them.
FOUR-YEAR	Evolutionary changes only. Preoccupation with systems in 70's has not prepared us for user demands of the 80's.	Rapid technical changes mitigate against keeping up during 80's. Data Processing literacy provided in 70's to masses will assist in keeping up with rapid techical changes.
UNIVERSITIES	80's will have 60's managers; therefore, not prepared. Yes, but major revolution in microprocessing, personal computing, and word processing	State-of-the-art reached in 70's; few impacting technical changes for the 80's. Too busy with current problems to prepare for the 80's.

GENERAL OBSERVATIONS: The general broad and sometimes superficial awareness of rapid technical changes by many throughout the organization is creating confusion of the role and readiness for the 1980's. There are serious unanswered questions regarding data management and security. In addition, the 1980's will demand user action rather than systems preoccupation.

3. During the 70's, what was the average increase per year of the computing budget at your institution?

	PRIVATE	PUBLIC
TWO-YEAR	No budget. Can not define.	10 percent.
FOUR-YEAR	15-20 percent. 10-12 percent.	Six fold increase. 15 percent.
UNIVERSITIES	2.5 percent. 8-10 percent.	20 percent. 5-6 percent.

GENERAL OBSERVATIONS: The data suggest the major growth area of the 1970's at four-year institutions. However, almost all institutions reported real increases beyond the rate of inflation.

4. During the 70's, what percentage of the total institutional yearly operating budget was spent on computer processing (average)?

	PRIVATE	PUBLIC
TWO-YEAR	Unknown.	5 percent. 2 percent.
FOUR-YEAR	2 percent. 2-2.5 percent.	8-9 percent. Unknown.
UNIVERSITIES	1-1.5 percent. 3-4 percent.	6 percent. 3 percent.

GENERAL OBSERVATIONS: During the course of the interview, almost all of the respondents suggested less dollar growth for their budget during the 80's than they experienced in the 70's. However, for various reasons, almost all centers had a difficult time indicating expenditures which suggests better institutional costing data is needed.

5. In terms of budget allocations, what approximate percentage reflects the situation at your institution?

		PRIVATE			PUBLIC		
		1970	1980	1985	1970	1980	1985
TWO-YEAR	People	--	25	50	40	50	60
	Other	--	75	50	60	50	40
	People	--	--	--	35	60	75
	Other	--	--	--	65	40	25
FOUR-YEAR	People	55	55	65	40	40	60
	Other	45	45	35	60	60	40
	People	34	40	50	50	50	50
	Other	66	60	50	50	50	50
UNIVERSITIES	People	60	50	60	--	33	Increase
	Other	40	50	40	--	67	Decrease
	People	66	66	75	47	47	47
	Other	34	34	25	53	53	53

GENERAL OBSERVATIONS: Overwhelmingly, respondents report more of their budgets will be allocated toward people during the 1980's. Their major reason was declining hardware costs.

COMPUTING SERVICES IN THE 80's: BLUE SKIES OR GRAY?

6. In the 80's, will more or fewer functions at your institution be reporting to the Chief Administrative Officer responsible for computing activities than has been the case in the 70's?

	PRIVATE	PUBLIC
TWO-YEAR	More, in order to better establish user priorities. Same.	More, because of on-line computing. More, because recordkeeping functions will report to Chief Computing Officer. Same, for those who have planning, research, and data processing in same line.
FOUR-YEAR	Unknown. Same.	More, because of increased use of data base management systems; one responsible data base manager with more offices reporting to him. Same.
UNIVERSITIES	More, because functions will be merged toward computer center. Same.	Unknown. Same.

GENERAL OBSERVATIONS: Interviewees suggest several forces at work: rapid technical changes and dynamic user needs are at odds with the bureaucratic organization. Thus, confusion is created as to future administrative responsibilities. Most indicated a need for more unity among operational users, but feared the "political" climate mitigates against substantial changes.

COMPUTING SERVICES IN THE 80's: BLUE SKIES OR GRAY?

7. What emerging (functional) areas will require more technical computing in the 80's than were required in the 70's?

	PRIVATE		PUBLIC	
	More Technical	Less Technical	More Technical	Less Technical
TWO-YEAR	Administrative Decision-Making Retrieval Accounting Academics	None	Purchasing Budget Analysis Inventory Physical Plant Financial Library Advising/Counseling Administrative Decision-Making	A&R will stabilize
FOUR-YEAR	Comprehensive Data Base Data Retrieval Data Administration Academics Internal Administration	Communications will be simpler for user	Networking Scientific Processing Word Processing Computer Auditing Fiscal Operations Decision-Making	None, current areas will demand more
UNIVERSITIES	Student Services for Recruiting Social Sciences Financial Areas	Role of Central Facility	Systems Programming Personnel Records	End user functions less technical

GENERAL OBSERVATIONS: Concensus is that almost all areas of the institution will require more technical computing. There will be more in present areas as well as more in yet to be defined areas. Also, there seems to be a feeling of more real use of the computing resource during the 1980's.

COMPUTING SERVICES IN THE 80's: BLUE SKIES OR GRAY?

8. Do you expect the distribution of staff in your organization to change significantly over the next ten years?

	PRIVATE	PUBLIC
TWO-YEAR	Yes, will need programmers for initial start-up. No.	No. Yes, enhanced systems programming, data base support, and applications will change staffs.
FOUR-YEAR	Yes, user service areas will grow and there will be few systems programmers in the center. No.	Yes, more technical staff needed; but few systems programmers. Yes, decentralization will create changes.
UNIVERSITIES	Yes, because of distributed processing there will be fewer people.	Yes, no data-entry staff, fewer user liaisons, fewer programmers, more hardware maintenance and data base maintenance staff. Yes, hardware maintenance will be in-house.

GENERAL OBSERVATIONS: Most felt that decentralization and data base approach will create a redistribution of staffs. Also, there was a suggestion that hardware maintenance may come in-house as well as building one's own peripherals.

9. How do you think salaries in the computing/MIS profession will change in the 80's?

	PRIVATE	PUBLIC
TWO-YEAR	Increase. Increase.	Increase, demand for people. Increase, demand and competition for people.
FOUR-YEAR	Increase, but still lower than industry. Increase.	Increase, to keep qualified staff. Increase demand.
UNIVERSITIES	Increase, will be a major institutional problem. Increase, at least for key people; many will change from academic teaching to MIS profession.	Increase, three times inflation rate. Increase.

GENERAL OBSERVATIONS: All respondents agreed that salaries in the profession will increase in the years ahead and will keep ahead of inflation. Various reasons were given but most revolved about decreasing hardware costs and the concomitant proliferation increasing the demand for people. Of much concern is the fact that outside salaries are "much greater" than institutional salaries and this is beginning to cause staff losses.

However, in many instances, present DP staff salaries are higher than faculty salaries, thus contributing to faculty unrest and creating a further hardship upon the data centers in their efforts to keep qualified staffs. The bright side is that this transition could be helpful for those faculty in low demand fields if they retrain. Also, such proliferation is creating a new student market which should increase academic program possibilities.

10. Do you expect the administrative line through which the computer center reports currently to change over the next ten years?

	PRIVATE	PUBLIC
TWO-YEAR	Yes, hopefully be separate entity reporting to President. Yes.	Yes, more and more toward Chief Executive Officer, No.
FOUR-YEAR	Yes, to higher officials or to unbiased systems committee. Yes.	Yes, it had better and to the President. No, too much of a political problem for change.
UNIVERSITIES	Yes, to Vice President for MIS. No, already report to Chief Executive Officer.	Can't say, politically related. Can't say, politically related.

GENERAL OBSERVATIONS: Almost all respondents indicated they do not presently report to the most effective line officer; but, because of their internal political situation, there will probably be no effective organizational change in the immediate future, However, they did express hope that as technology changes the impact of DP that the long range future for effective organizational change held more hope. A major problem identified by many is that the computer center and the primary users do not report through the same line thus causing operational problems to be resolved other than at the operational level.

11. What professional workshops and/or seminars will be needed to keep abreast of EDP in the 80's?

	PRIVATE	PUBLIC
TWO-YEAR	Unknown	State-of-the-art Training in technical concepts Data base administration Communications technology
FOUR-YEAR	Communications Data administration State-of-the-art Technical workshops	Training of the users of end products Better workshops are needed
UNIVERSITIES	Communications Word processing Office automation Financial modeling Data base management Statistical packages	User workshops Vendor schools/workshops for use of their specific products User training

GENERAL OBSERVATIONS: The problems faced by training staffs in the future are as diverse as the changing technology. All are faced with the same problem, "What is the state-of-the-art?" Another concomitant situation is the diversity among institutions and staffs in their level of expertise as to how new technology may assist in DP activities.

COMPUTING SERVICES IN THE 80's: BLUE SKIES OR GRAY?

12. What do you expect to be the single most significant change in the computing/MIS activities in the 80's?

	PRIVATE	PUBLIC
TWO-YEAR	Unknown, but rapid change.	Interactive computing. Pluralistic approach to data processing revolving about distributed and centralized processing.
FOUR-YEAR	Use of data processing in decision-making and management.	From a hardware to a software orientation. Movement of computer literate personnel into mid- and top management will cause use of computing as a "matter of course."
UNIVERSITIES	Distributed processing. Decentralization of site. Communications. Depoliticalization of computing function.	Pervasiveness of computing including social users. Advent of micro-processor will increase use but decrease average understanding.

GENERAL OBSERVATIONS: Most mentioned the interaction of micro-processing, interactive computing, and the demand of the public for use as setting the stage for significant change. During the 70's, data processing did not "touch" the masses; but during the 80's, it will and that will bring about a large increase in awareness and utilization. As this charge moves through the decade, it appears that considerable turmoil will accompany the process.

Expectations versus Reality of Statewide Data Systems: Central Policy Questions in an Era of Financial Retrenchment

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The emergence of statewide data collection systems in the late sixties was expected to strengthen the position of central governing boards with their legislative bodies and to enhance their ability to guide effectively public higher education. Statewide systems were further expected to meet needs of various levels of management/administration. While many statewide data systems were developed in response to anticipated needs for accountability, they, in reality, merely gather data that is rarely interpreted for administrative use. In an economy-conscious era, the expense of technological systems must be justified.

This paper addresses the practicality of statewide data systems. First, expectations of these data systems are contrasted with reality. Then, five central policy questions are identified with their implications. The example, Georgia's Regents' Consolidated Reporting System, is currently under reassessment by the staff of the central board and representatives of the participating institutions.

*This paper does not consitute
an official position of the
institution. It is based solely
upon the opinions and experiences
of the authors*

Expectations versus Reality of Statewide Data Systems: Central Policy Questions in an Era of Financial Retrenchment

Prompted by financial stress, national leaders are now speaking out on behalf of postsecondary institutions concerning the external data requirement issue. Firnberg and Lasher (1979) wrote:

> Those who plan--that is, the institution's major decision-makers--must have relevant and timely information . . . meeting these analytical and planning responsibilities will be difficult during a time when funds for additional staff resources are minimal at best and non-existent at worst. To engage in these important internal activities in the face of external reporting demands . . . we must actively continue to pressure state and federal governments . . . for fewer and more realistic data requirements (p. 277).

In this context, we examine the practicality of statewide data collection systems.[1] First, expectations of these data systems are contrasted with reality. Then, five central policy questions, believed to have commonality among states, are identified with their implications. The example, Georgia's Regents Consolidated Reporting System (RCRS), is currently under reassessment by the University System Ad Hoc Committee on Information Collection and Utilization. The committee membership includes five Board of Regents staff members and seven members from the 33 participating institutions.

In Georgia, all public higher education is governed, managed, and controlled by one central board, the Board of Regents of the University

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[1] At Georgia State University, the institutional research staff of the Office of Institutional Planning performs an information clearinghouse function for the total university (Bryson, 1977). One purpose of this clearinghouse function is to ensure timeliness, consistency and accuracy in external reporting. Hence, the authors are directly involved in Georgia's Regents Consolidated Reporting System (RCRS) from an institutional perspective. Moreover, they were invited to present their position on this data system to the system-wide committee engaged in reassessing the RCRS. The authors are continuing to serve as consultants to the committee.

System of Georgia. This constitutional board, established in 1931, is also a public corporation. Figure 1 shows the comprehensive composition and scope of the University System of Georgia. It also depicts the geographic locations and types of institutions participating in the statewide data collection system as established by this board.

Expectations of Statewide Data Systems

As the complexities of public higher education increased in the sixties, the necessity of and desire for accurate and readily available information at state levels intensified, particularly because of federal regulations and requirements. Out of this desire for instantly accessible information, large-scale systems were envisioned by many states to be the most appropriate and efficient vehicles for data collection and for demonstration of accountability. Through provision of timely, concise data, most statewide data systems were expected to enhance the state board's relationship with the legislative body and aid in administrative/management decision-making and reporting processes at all levels. Similar expectations were noted as the University System of Georgia's RCRS was established.

The establishment of the RCRS in Georgia was expected to provide the Board of Regents and individual institutions with timely and concise information. At the Regents' level, analysis of institutional data was expected not only to provide summary information but also to allow for detailed comparisons between institutions, academic schools, departments, and individuals.

At the institutional level, the RCRS was expected to provide standardization of data that would meet local operational needs and aid in federal and state reporting. The inter- and intra-institutional analyses were expected to be of great benefit in the annual budgetary process at each participating institution.

Additionally, the availability of so much information was expected to improve the board's relationship with the legislature and governor. In Georgia the ability to respond quickly to legislative requests for information with comprehensive and accurate data was quite difficult during the rapid growth of the sixties. The RCRS was also intended to

INSTITUTIONS OF THE UNIVERSITY SYSTEM OF GEORGIA

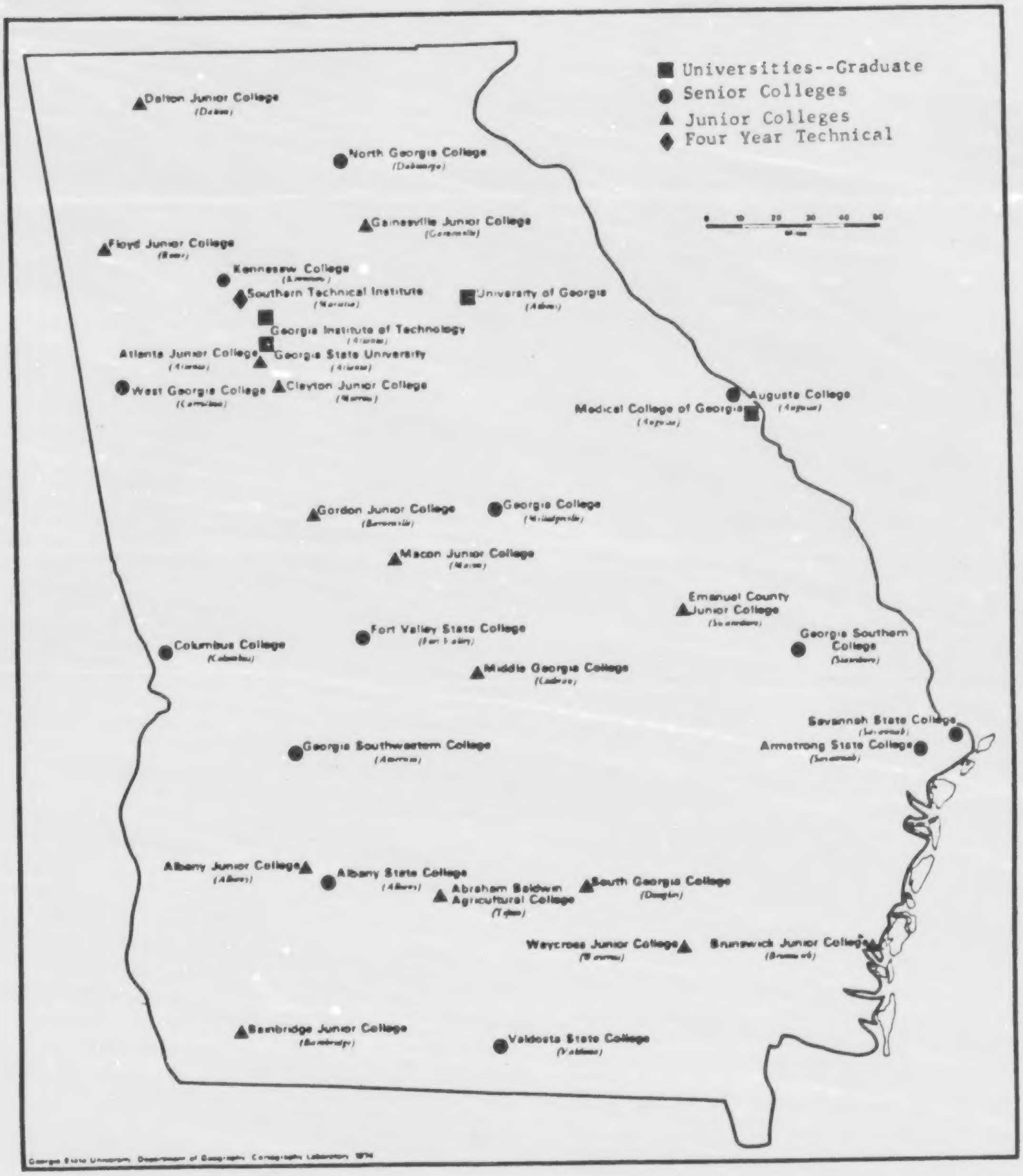
■ Universities--Graduate
● Senior Colleges
▲ Junior Colleges
◆ Four Year Technical
Dalton Junior College
North Georgia College
Gainesville Junior College
Floyd Junior College
Kennesaw College
Southern Technical Institute
University of Georgia
Georgia Institute of Technology
Atlanta Junior College
Georgia State University
West Georgia College
Clayton Junior College
Augusta College
Medical College of Georgia
Gordon Junior College
Georgia College
Macon Junior College
Emanuel County Junior College
Fort Valley State College
Columbus College
Georgia Southern College
Middle Georgia College
Savannah State College
Armstrong State College
Georgia Southwestern College
Albany Junior College
Albany State College
Abraham Baldwin Agricultural College
South Georgia College
Waycross Junior College
Brunswick Junior College
Bainbridge Junior College
Valdosta State College
Georgia State University Department of Geography Cartography Laboratory 1974

Figure 1

SOURCE: Board of Regents

aid the board and legislature in the determination of appropriate allocations for institutions of higher education.

Expectations Versus Reality

Since the efforts in Georgia were similar to efforts by other state higher education boards, it is not surprising that the "expectations versus reality" of Georgia's RCRS has a commonality with other statewide data systems. Drawing from the literature of higher education,[2] the divergence between systems expectations and reality appears two-fold. First, instead of meeting information needs, statewide systems are generally characterized by an information lag. In reality, there is a surplus of data but a deficit of usable information. This deficit results from lack of feedback to the individual institutions, poor timing, and inadequate data definitions and standards. Second, there is a great contrast between the assumptions on which educational management systems are based and the reality of the context in which higher education administrators operate. The philosophies and management design imposed by most statewide data systems warrant reassessment.

Information is Needed for Decision-Making at All Levels

Administrators need information, not raw data, for various reasons, but one of the more pressing needs of institutional information is for decision-making. Decisions based on reliable and timely information are more likely to be effective than those made on the basis of incomplete, incorrect or irrelevant data. Diran (1978) suggested that management information systems frequently have been developed as an antidote to decisions usually made on the basis of political allegiance or friendship. Baldridge (1979), on the other hand, found that information systems are frequently no antidote at all. An Exxon-funded MIS project at 50 institutions produced the unanticipated result that "projects furnished entirely too much unfocused data, tons of junk with no point of concentration . . . this complaint arose many times. The decision process can actually be slowed down by data if they are not focused and condensed" (p. 271).

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[2] See, for examples, Adams, Kellogg & Schroeder, 1976; Balderston, 1974; Board, 1972; Braniff, 1977; Gardner & Parker, 1978; Laughlin, 1975; McGovern, 1975; Meisinger & Purves, 1975; Norris & Heydinger, 1975; Schroeder & Adams, 1976; Smith, 1975; Tetlow & Chase, 1976.

The establishment of RCRS in Georgia was expected to provide individual institutions and the Board of Regents with timely and concise information for decision-making. However, to be of benefit to the decision-making process within the individual institutions, there should be a two-way channel of communication. Information must constantly flow from the board to the institutions as well as from the institution to the board (Bryson and Smith, 1978).

Finally, to enhance the decision-making process at the institutional level, focused and condensed data (i.e., data summaries and the results of data analyses) must be shared on a timely basis. Prompt feedback to administrators is extremely important; they can thus evaluate individual institutional operations, not only internally but also externally, within the operational context of the state educational system as a whole. This timely and effective exchange of information assists all levels of administration in making sound decisions.

But an unanticipated reality of Georgia's RCRS is the existence of an informational lag. There is a surplus of uninterpreted data but a deficit of timely and usable information. Topping (1979) attributed this same problem in Florida to the fact that MIS was developed in a fragmented manner. Most systems were designed primarily for operational rather than for decision-making purposes. Systems which tried to anticipate other needs often produced a plethora of irrelevant and unmanageable data. The resulting systems lack feedback to participating institutions and have poor timing and inadequate data definitions and standards. Arns (1979) stated that information "implies the creative intervention of human intelligence in the aggregation and organization of data and an intent to communicate" (p. 32). For data to become information, data analysis and interpreters must be able to link appropriate data elements in a reliable, logical, and timely manner.

Underlying Assumptions of Statewide Data Systems

In Georgia, the Vice Chancellor of the University System, in a memorandum dated February, 1973, to presidents, chief academic officers and chief fiscal officers of each participating institution, stated the system-level assumptions of RCRS as follows:

> The increasing demands for information, placed upon the University System both by internal and external users, has led to the necessity for the development of improved methods of system management and reporting. The required methods must be capable of meeting the operational needs of each institution while at the same time providing standardized reporting for use at the Regents' Central Office, other state agency, and federal agency levels.

The governor of Georgia articulated the state-level assumptions that "this information system will give managers within the University System added information upon which to make management decisions and budget requests . . . when completed, the system will provide information about programs, the attainment of System objectives, and the rationale for the funding formula and other budget requests" (Busbee, 1977, pp. 26-27).

It appears that Georgia's existing RCRS and other statewide MIS's have fared much better in theory than in reality. There appears to be general agreement in higher education that the major problems are more human than technical in nature. The University System of Florida, comprised of nine public universities, undertook a study to develop a plan for addressing problems experienced with their statewide data system. The study concluded that "the assumption that problems centered around technical elements was found to be invalid" (Topping, 1979, p. 34). The problems in the Florida system stemmed not from computer hardware or software deficiencies but from ineffective overall human management practices.

The list of suggested reasons for the general failure of statewide data systems is well-documented in the literature of higher education. Parker and Gardner (1978) suggested five reasons for the failure of many MIS's: 1) top management was not committed to the system,

2) insufficient understanding and appreciation of MIS information, 3) inadequate resources to support adequately the system, 4) personnel turnover, and 5) insensitivity to human/political problems. They concluded, however, that the primary reason for the failure of MIS's to meet expectations is caused by an erroneous assumption that higher education is managed, not administered.

Parker and Gardner (1978) maintain that the principal difference between managed and administered organizations is the primary source of revenue. Managed organizations mainly depend upon clients for revenue whereas administered organizations are budget-based and are dependent upon legislative or similar appropriations. Their differences in purpose and characteristics call for different kinds of decision-making information. Higher educational administration, unlike industrial management, frequently lacks clearly formulated goals and objectives because of their commitment to academic tradition and democratic governance. Gardner and Parker (1978) believe that this is the reason that these administrations tend to be issue-driven rather than goal-oriented. Saunders (1978) called this participative management and noted that decision-making in a university environment tends to involve many groups.

Cameron Fincher (1975) finds the issue more complicated and poorly understood. He believes that educational institutions are presently involved in assimilating the changes of the sixties and that they must evolve a grand strategy with "acceptable solutions to identifiable problems" (p. 12). In Fincher's opinion, four grand strategies to regain consensus have been offered--accountability, alternative learning, planned change, and the policy sciences. But in a careful analysis he concludes that "American colleges have enough superficial similarities to corporate business and industry to make the adoption of managerial techniques quite sensible as a form of protective coloration" (p. 13), but little else. The wholesale adoption of large scale management information systems ignores the peculiarities of higher education and above all ignores the need for much groundwork to be laid and a new set of rules to be devised. In all, the grand strategy of "accountability has thus far failed to develop an adequate concept of evaluation, to provide useful measures of educational effectiveness, and to specify how the information and data so arduously gathered can be used for institutional and program improvement" (p. 14).

Central Policy Questions

From this broad perspective on statewide data systems, policy questions which are central both to the RCRS in Georgia and comparable systems in other states can be identified. The first three questions consider important technical and human problems in information lag. The other two questions address the fundamental, underlying assumptions of statewide data collection systems.

Question one: Do such data systems have the capacity to serve decision-makers at all levels?

In a state system of education there exist many levels of information. What educational administrators often call incorrect information is often quite accurate but is an irrelevant or inappropriate level of information. Data analysts and interpreters, at both system and institutional levels, would do well to provide administrators with relevant information appropriately summarized for both the level and managerial role in which the administrator is expected to function. Administrators at both the system and institutional levels should be willing to critique and provide feedback on data analysis endeavors.

At the present time the RCRS Annual Summary Report contains data analyses aggregated to a level that precludes its effective use within the university in budget deliberations concerned with faculty resource utilization. Universities are organized into units by departments and colleges. The faculty, student and curricular data analyses contained in the RCRS Summaries do not recognize these administrative and budget structures peculiar to universities.

Thus, the range of problems found in various statewide data systems suggests that the source of discord is more human than technical. The many problems cannot be alleviated by writing innovative computer programs or purchasing sophisticated hardware. People design, run, and use the data system. Therefore, when considering solutions for the Georgia RCRS and other state MIS's, human factors must be considered.

Question two: Can feedback be timed to meet institutional needs?

Frequently the participating institutions are so concerned with meeting system-imposed reporting deadlines that they have neither the time nor the resources to access their own operational data for decision-making information appropriate to their level of responsibility. Moreover, when information from RCRS is not shared on a timely basis with officials directly responsible for institutional operations, institutions are apt to feel that RCRS is more of a hindrance than a help to their operations. At the present time the RCRS Annual Summary Report is irregularly distributed to participating institutions and is therefore unrelated to institutional operational needs to meet system time requirements for budget and annual report preparation.

Question three: Without standardization of definitions of required data elements, can reliable information be produced?

The recently appointed Ad Hoc Committee on Information Collection and Utilization in Georgia is beginning its technical work of standardizing data definitions for external reporting for 33 separate institutions. Until the basic data gathered at the institutional operational level consists of standardized definitions throughout the state, it must be assumed that any resulting decision-making information from the RCRS will contain distortions.

Question four: Can a statewide data system be integrated into the decision-making processes?

Another problem found with large-scale data systems is one of unrealistic assumptions. If educational administrators do not function as managers, giving them managerial information may constitute giving them irrelevant information (Walker, 1979; Fincher, 1975; Gardner & Parker, 1978). Powers (1978) observes that "the academic administrator has not been traditionally viewed as a manager. His appointment to and retention in his administrative position is more likely to be based on scholarly achievement than on management experience or skill" (p. 66).

Baldridge (1979) notes that management information systems will probably increase centralization of management power in institutions. At the same time he believes that in the real world of management and administration, shared power and conflict over resources have to be handled rather than hidden. It is highly desirable to link the planning process, the data-gathering process, and the budgeting system. Earlier discussions in this paper have addressed the idea that administrators of higher education need information primarily for decision-making. Schroeder and Adams (1976) believe that the success of an MIS hinges on its own capacity to be integrated into the consensual decision-making process found in most institutions of higher education. Therefore, to justify the immense effort and expense involved in establishing and maintaining any statewide data system, the system needs to be integrated into the existing decision-making processes at all participating levels. This seems to be a critical policy-level question with regard to any statewide data system.

Question five: Is there comparability and compatibility in statewide information?

The RCRS in Georgia was expected to provide the state with comparable information on its public institutions of higher education. This was to be achieved by attempting to standardize definitions of the required data elements. Moreover, a central policy issue yet to be resolved is whether or not the RCRS can adequately reflect differences in missions, programs and operational structures of existing institutions. If a statewide data collection system cannot comprehensively capture both quantitative and qualitative measures, can it accurately reflect realistic comparative information about the many different institutions? Because the present statewide data system was not designed to capture and reflect some of the vast differences observed among participating institutions (i.e., class scheduling at a small residential junior college as compared to a large, non-residential, extended-hours university), many kinds of comparative analyses seem to be inappropriate. Taking into consideration some basic limitations of most statewide data systems prompts individuals at the institutional level to be apprehensive about possible inappropriate comparisons among institutions.

Implications for the Eighties

Statewide data systems designed in the sixties are capable of capturing and storing a lot of numbers, but are they relevant to the decision-making needs of educational administrators in the eighties? An elegant data system may look impressive, but it is impractical if the participating institutions cannot obtain meaningful analytical information pertinent to their needs. Data element dictionaries may specify basic data formats, but they cannot guarantee that valid comparative information will result when basic data are expected to describe non-standardized institutions. Appropriate decision-making information is not always produced by attempts to interpret data if in the first place those data are not relevant to the role or function of the people who receive them. A critical policy question in higher education today is whether or not the design of a statewide data system can adequately reflect quantitative and qualitative differences in missions, programs, and operational structures of existing non-standardized institutions. If a statewide system cannot comprehensively capture these differences, can it accurately reflect realistic comparative information about the many different institutions?

In this economy-conscious era, the expense of costly technological systems should be considered. While many statewide data systems were developed in response to anticipated needs for accountability, in reality they often gather massive amounts of data that are rarely interpreted for administrative or managerial use. Perhaps in the eighties more emphasis can be placed upon efforts to develop realistic assumptions in order to make statewide data systems relevant, usable and accountable.

Professional associations such as College and University Systems Exchange (CAUSE), Association for Educational Data Systems (AEDS), The Association for Institutional Research (AIR), and Society for College and University Planning (SCUP), are serving as catalysts to identify data system problems and suggest a more economical and realistic approach to providing relevant information for decision-making. Their literature suggests, repeatedly, that reassessment of large-scale data systems in higher education should deal primarily with underlying policy assumptions and human factors and avoid tendencies to concentrate on technical methods of implementation.

In this era of limited resources, state boards and institutions of higher education are finding it necessary to reexamine carefully all phases of their operations to insure maximum benefits at a minimum expense. Currently, the University System of Georgia is exploring data requirement issues. The Ad Hoc Committee on Information Collection and Utilization has been charged to provide recommendations for a suitable course of action. This noteworthy action calls for input and support of the state system as a whole. The committee, in conjunction with the officers of the Board of Regents, can determine whether or not the stated assumption that RCRS "must meet operational needs of each institution" is realistic and economically feasible under present and anticipated financial conditions within the University System of Georgia. The central policy questions identified in this paper common to many statewide data systems currently are being explored by the University System of Georgia and its 33 participating institutions.

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PLANNING IN THE 80'S - INVOLVEMENT, SYSTEMS AND COMMUNICATION - THE ART OF DECISION-MAKING

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The coming decade will be one of accelerated change and limited resources. The pressures of continued budgetary constraints will be felt in every phase and at every level of the academic community and the responses to these pressures will, in large measure, determine the complexion of private higher education into the next century. The ability of management to be meaningfully responsive in such an environment will be greatly influenced by: (1) the level of involvement--top management actively participating in establishing priorities; (2) the systems available-- rapidly changing technology causing resultant changes in policy/procedural and people systems; (3) successful communication--information dissemination depending upon formal and informal channels and consistency in decision-making.

This paper will explore the interdependencies of these elements (from the viewpoint of a mid-sized private institution) utilizing the perspective that decision-making is the vital art in meeting the needs of educational management as it confronts the issues of the 80's.

Introduction

Pepperdine University is a mid-sized (about 6,000 students) independent institution operating from two campuses in Southern California through five schools and colleges. During the late 60's and early 70's the University experienced a rapid growth period, almost quadrupling in size. The mid to late 70's brought a reversal in the enrollment trend. This was partially due to administrative decisions to reduce the size of the institution and partially due to unforeseen factors. This same time period also saw a concerted effort to design and develop a management information system to meet the perceived needs of the organization.[1]

The initial five-year MIS project is nearing completion, almost one year behind schedule in some aspects and over two years ahead of schedule in others. The institution as part of the world of higher education is about to enter into the decade of the 80's, perhaps the most challenging decade yet to be experienced. It is in this context that a new five-year plan for information systems is being developed.

This paper will set forth the assumptions concerning the essential elements of the planning process used in updating the University's I.S. plan.

A Scenario of the 80's

Any realistic planning effort must take into consideration the environmental impacts which may affect the implementation of the plan.[2] The following points are widely discussed in the literature and certainly will impact private higher education in the next decade.

-In the past, private institutions dominated higher education in the United States; today they account for only 22 percent of enrollment and the proportion is steadily declining.[3]

-In the next ten years, unless there are changes in funding, there will be a drop of 45 percent in the student population of private institutions of higher education.[4]

-By 1995, the country's traditional college-age population will be only three-fourths of what it is today.[5]

-If inflation is not sharply curbed, prices may increase by as much as 100 percent during the next decade.[6]

-Inflation hits educational institutions harder than most other enterprises because it is harder for them to pass on cost increases to their customers.[7]

-Much of the so-called fat in college operations has been eliminated in the 70's due to improved management practices.[8]

-By the late 1980's the cost of tuition will have increased by a factor of almost four even if the inflation rate averages no more than 6 percent per year.[9]

-Colleges cannot reduce their expenses in proportion to declines in enrollment so they will need added funds while educating fewer students.[10]

-The median age in the United States which was 27.9 in 1970 will approach 40 within the next two decades.[11]

-The number of persons with college degrees is increasing faster than the professional-administrative positions to which half of them aspire.[12]

-Negative attitudes toward college and attending college may develop due to the findings of researchers about the declining dollar value of a college education.[13]

-Major corporations may develop their own "university" in which they sponsor their own education, not only in technical fields, but in writing, mathematics, etc.[14]

-Industries may award "degrees" because it is more economical and more effective to develop their own programs than to rely on educational institutions.[15]

-Technological devices including video tape cassettes, video disks, and microcomputers hooked into a central system through telephone lines may lead to college graduates who have never spent one day on a campus.[16]

These observations about enrollment, inflation, costs, efficiency, public attitude, demographics, and industrial trends are sobering for those of us in private education to say the least. The ability to survive such environmental impacts, however, lies first with the institution themselves--primarily in their capacity for developing self-discipline, clarity of mission which accents distinctive images of value and quality, and more effective means of marketing their virtues. Secondarily, it is providing at the state level better informed and more equitable policies toward private institutions.[17]

Information systems which are designed to meet "real" institutional needs not theoretical needs and which consider "soft" data as well as "hard" data as meaningful information can be most useful in providing the basis for strategies which address the points needed for survival as noted above.[18]

Good information systems alone, however, do not provide an end all solution. Robert Murray of the Diebold Group recently published the following thoughts concerning the opportunities for management decision-making during the 80's for businesses. The authors take the liberty to insert words which pertain to education rather than business and submit these ideas as a summary of what private educational institutions can expect from the 80's.

1) The prospect for the 80's is for a continuing and increasing rate of change.

2) No quantum jumps in technology are expected, but there is a real need to make the most of what is available.

3) There is a need for better information in all quarters of the institution and the educational marketplace for quick decision-making.

4) The men and boys will be sorted out by the speed of meaningful reactions to an increasingly demanding constituency.

5) There is a need for management, not MIS, to appraise its requirements and to form an information strategy and policy, without which administration and MIS departments cannot adequately work.

6) There is a need to manage information as a resource.

7) The "winners" in the 80's will be those who can react quickly to good, accurate, timely information.[19]

Effective Management Information Systems begin and end with good management. An absolute necessity of good management is involved managers.

Management Involvement

A recent publication reported an analysis of successful and unsuccessful MIS efforts during the 70's in some thirty colleges and universities. In the unsuccessful institutions some 53 percent indicated that the top administration was "supportive" and 24 percent thought the top administration was "involved." As a contrast, in the successful implementations nearly 90 percent felt the administration was "supportive" and 73 percent thought the top administration was "involved."[20] We, therefore, believe it is fair to say that top administrative support is a life-or-death matter.

Management may be viewed as the dynamic force which converts human and nonhuman resources into organizations. It is a process which integrates previously unrelated resources into an organism that is greater than the mere sum of its parts. The purpose of management is to coordinate the activities of people in organizations, while its overall role is to facilitate the effective and efficient attainment of organizational goals and personal needs of its members.[21] This is accomplished to a large degree through the process of planning.

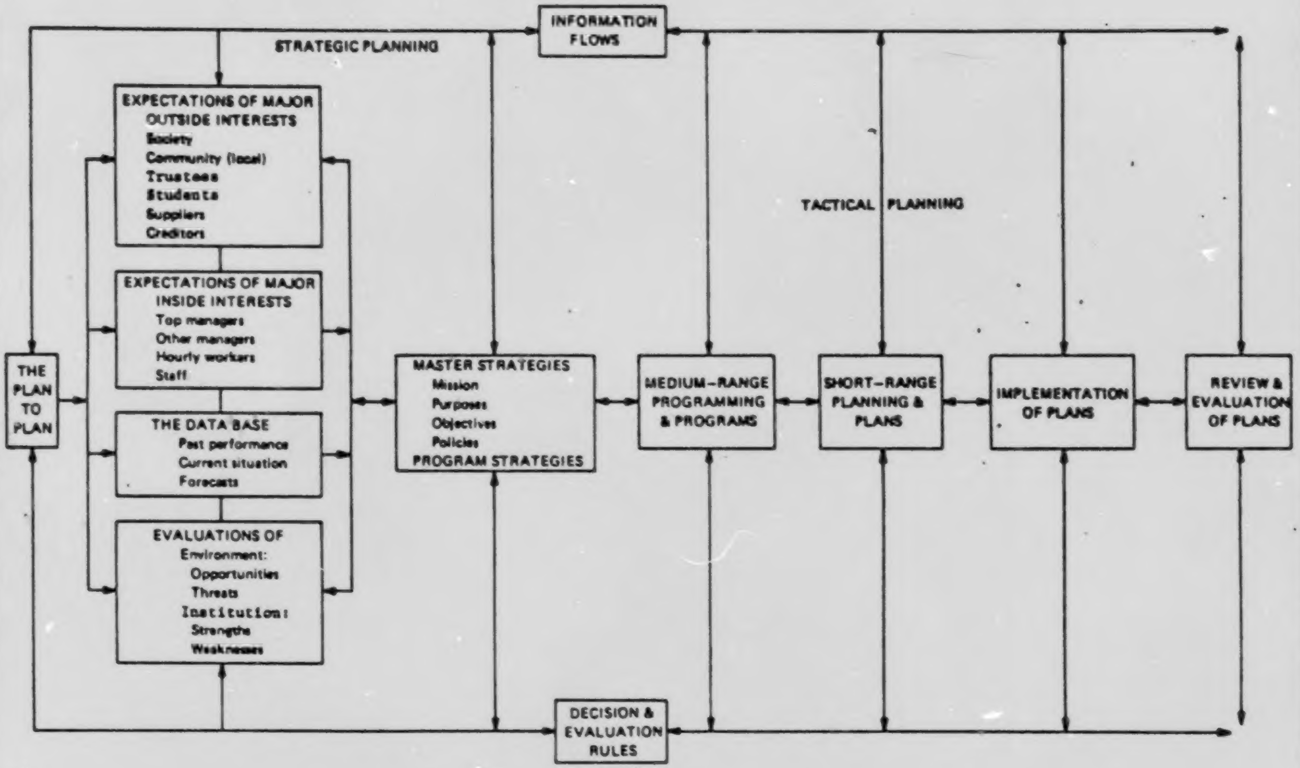
The importance of planning given the scenario of private higher education in the 80's previously set forth, is highlighted by the following quote:

> Planning is a necessary function in all organizations; however, the need increases as turbulence in the environment intensifies. When uncertainty exists, organizations must plan for environmental contingencies to adapt successfully to change. With the current educational environment in such turmoil, strategic planning has become an important tool in higher education; however, this increasing importance has brought additional problems. The abrupt change from a relatively stable environment to one so volatile has left colleges and universities without proper knowledge and mechanisms necessary for good strategic planning.[22]

At Pepperdine, in attempting to address both the involvement issue and the need to gain necessary strategic planning knowledge, the President has reconstituted the Systems Committee[23] which served as the "policy board" for Computer Services into a smaller Systems and Planning Committee. This group is made up of the five operational Vice Presidents and the Executive Assistant to the President and is responsible for putting together and implementing a plan for planning as well as systems related policy decisions.

The Committee routinely meets every other week for two hours and intends to spend time in off-campus retreats concentrating on planning at least trimesterly. The overall planning design is shown in Figure 1 and is modeled on the concepts of Steiner and Miner.[24]

Figure 1. Structure and Process of Institution-wide Planning


INFORMATION FLOWS
STRATEGIC PLANNING
TACTICAL PLANNING
EXPECTATIONS OF MAJOR OUTSIDE INTERESTS
Society
Community (local)
Trustees
Students
Suppliers
Creditors
EXPECTATIONS OF MAJOR INSIDE INTERESTS
Top managers
Other managers
Hourly workers
Staff
THE DATA BASE
Past performance
Current situation
Forecasts
EVALUATIONS OF
Environment:
Opportunities
Threats
Institution:
Strengths
Weaknesses
THE PLAN TO PLAN
MASTER STRATEGIES
Mission
Purposes
Objectives
Policies
PROGRAM STRATEGIES
MEDIUM-RANGE PROGRAMMING & PROGRAMS
SHORT-RANGE PLANNING & PLANS
IMPLEMENTATION OF PLANS
REVIEW & EVALUATION OF PLANS
DECISION & EVALUATION RULES

Source: George A. Steiner and John B. Miner, Management Policy and Strategy, MacMillan, New York, 1977, p. 18.

The concepts of "systemics" and "satisficing" perhaps best illustrate the hopes and desires of the President and the Systems and Planning Committee.

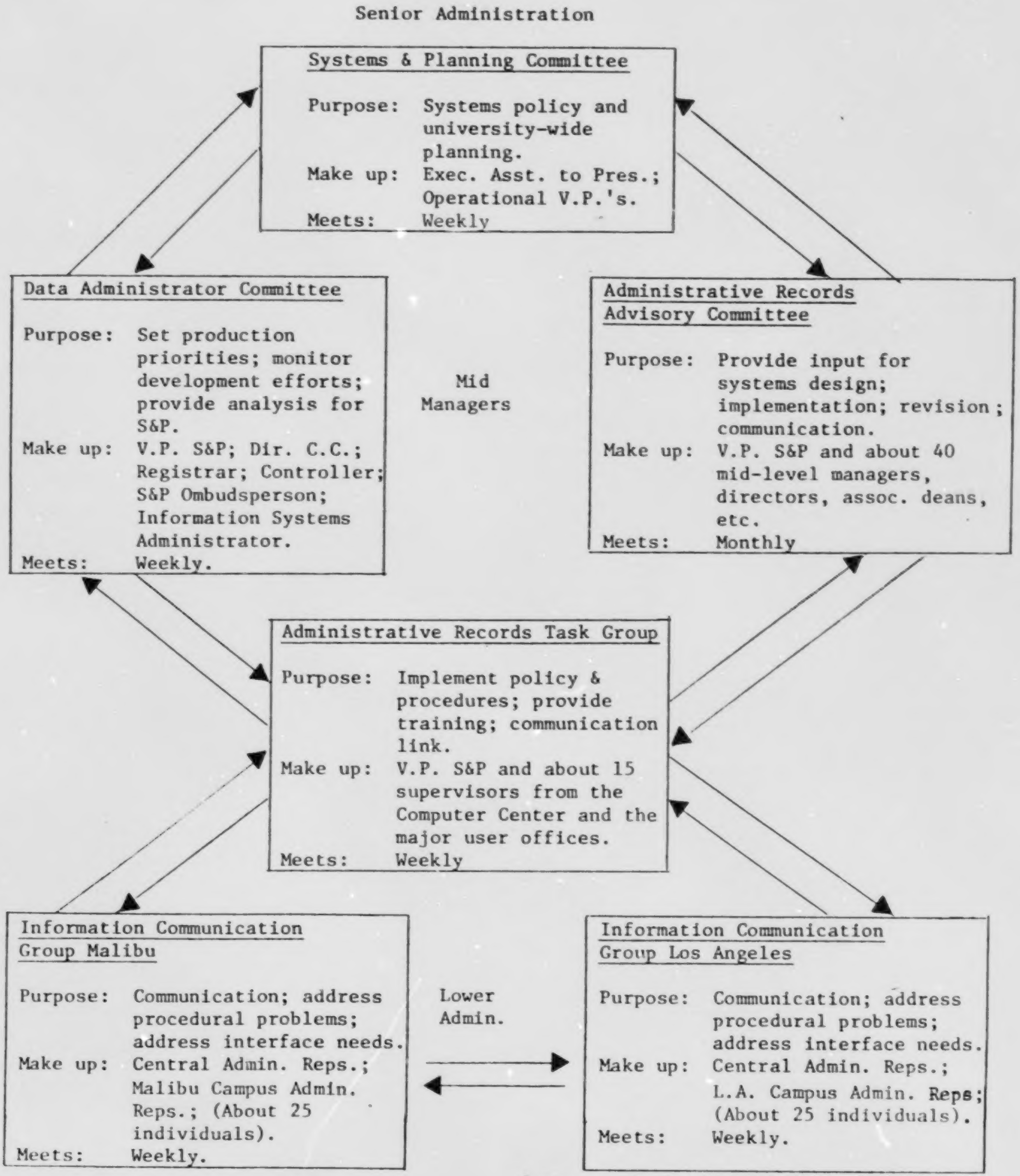
Systemics means relating to the body as a whole; thus, systemics seeks to address functions or administrative units in their entirety and not limit its analysis and design only to computer support systems. This means that the administration will be involved in the operations, objectives, and philosophies of our overall system.[25]

Satisficing is the idea that unlike the classical decision-making illustrations, you do not have the alternatives. You must go out and get them and you may have very shaky ways of evaluating them when you do find them. Thus, you look for alternatives until you get one which from experience and from what you have reason to expect, will give you a reasonable result.[26]

Satisficing does not mean managers have to be satisified with what alternative pops up first in their minds or in their computers. By personal determination, setting higher individual and/or organizational standards, and by use of an increasing range of sophisticated management science and computer-based decision-making and problem-solving techniques the level of satisficing can be raised.[27]

Administrative involvement only begins at the top. The middle managers "make it happen." The process of middle

Figure 2. Diagram of Pepperdine University Administrative Involvement in MIS



Systems & Planning Committee

Purpose: Systems policy and university-wide planning.
Make up: Exec. Asst. to Pres.; Operational V.P.'s.
Meets: Weekly

Data Administrator Committee

Purpose: Set production priorities; monitor development efforts; provide analysis for S&P.
Make up: V.P. S&P; Dir. C.C.; Registrar; Controller; S&P Ombudsperson; Information Systems Administrator.
Meets: Weekly.

Administrative Records Advisory Committee

Purpose: Provide input for systems design; implementation; revision; communication.
Make up: V.P. S&P and about 40 mid-level managers, directors, assoc. deans, etc.
Meets: Monthly

Administrative Records Task Group

Purpose: Implement policy & procedures; provide training; communication link.
Make up: V.P. S&P and about 15 supervisors from the Computer Center and the major user offices.
Meets: Weekly

Information Communication Group Malibu

Purpose: Communication; address procedural problems; address interface needs.
Make up: Central Admin. Reps.; Malibu Campus Admin. Reps.; (About 25 individuals).
Meets: Weekly.

Information Communication Group Los Angeles

Purpose: Communication; address procedural problems; address interface needs.
Make up: Central Admin. Reps.; L.A. Campus Admin. Reps; (About 25 individuals).
Meets: Weekly.

management involvement at Pepperdine has changed little from previously published descriptions.[28] The fact that there has been no major change in this area is not indicative of a lack of ongoing examination but rather of what we believe to be a process that is working rather well. Figure 2 provides a diagram of the interrelationships between management levels at Pepperdine.

Middle manager commitment is particularly important in exercising good managerial control, e.g. insuring that actual events conform to plans. Managerial control is the comparison of standards against actual performance and it should be noted that it is an essential element in evaluating the planning process. Good managerial control is of particular significance in an era such as that outlined in the opening scenario of the 80's of scarce resources and increased demands for accountability.[29] Without doubt the ability to exert managerial control is enhanced with the availability of good systems.

Systems

Computers are becoming more sophisticated, smaller in size, and less expensive. During the past four years, the cost of electronics has been going down 30 percent a year and the cost of storing information has gone down 50 percent per year. It has been predicted that by late 1981 a 500 dollar million-byte computer will be unveiled. The possibilities that a computer of that size and price would bring to higher education and the home, are almost undreamed of. It seems safe to believe that computers will cost only about one-tenth as much by the end of the 80's as today's machines--and will be four times as powerful. Software development is also advancing rapidly although without the dramatic decrease in cost.[30]

Such continuing cost/performance gains and declining computing costs are important because this is one of the few areas where inflation may be successfully fought through increased productivity. In this context we need to educate management (even computer center management) and potential users on how to exploit this technology.[31] Indeed such technology coupled with the cost/performance gains brings the urgings of B.E. Cherrington toward academic administrators to use cost analysis in academic decision-making into the realm of reality.

Dr. Cherrington states:

> A good institutional management tool could consist of a central data bank containing general student, staff, faculty, and financial information into which unit managers, including department heads, could tap. Comparative data from the AAU data exchange (or the best equivalent for the institution) might also be included. Remote computer terminals would permit access to the data along with the use of the central computer for analysis. For departments or colleges that would like to process and store a significant amount of "local" data, low cost minicomputers with telephone tie-ins to the central data bank offer the maximum flexibility.[32]

The quotation alludes to the concept of Distributed Data Processing (DDP). Some believe DDP to be the answer to the centralization versus decentralization issue primarily because it appears to offer the advantages of each without the disadvantages of either, i.e., low cost, central management control, and local operational autonomy. Such advocates are quick to add, however, that DDP must be controlled and that without adequate controls potential savings will be lost and difficult new problems will come about.[33]

The goal of Pepperdine is to continue moving toward the completion by the end of 1980 of a system similar at least to the one described above. There are plans for DDP activities in the application areas of accounts receivable, admissions/recruiting, and payroll/personnel with other areas being considered.

All of the integrated systems have retrieval modules that permit the extraction of ad hoc data with relative ease. Subsets may also be created which allow statistical manipulation through the use of SPSS or Biomed.

The institution is also using the Educom Financial Planning Model (EFPM) available through Edunet to build a university budget model and a university cash flow model.

A major systems concern for Pepperdine and for other institutions who chose to move in a similar direction is that of providing an information analyst or interpreter. We believe it is unrealistic to expect administrators to be experts in data base management, computational schemes, budgetary coding procedures, and the numerous fine points in accounting or student records that are necessary to formulate an accurate, consistent, and reliable information study. The administrator(s) and the information analyst should discuss what decisions are to be made, what data are necessary to support those decisions and, finally how the data can be properly obtained from institutional records. Cooperation and compromise are essential if the information needs of several administrators are to be meshed into a general request. However, the request must reflect the administrators' requirements rather than the analyst's desires.[34]

Ideal personality traits for such interpreters would include: good judgment and considerable objectivity; creativity and imagination; human relations skills such as leadership, tact, diplomacy, and helpful concern; and the ability to communicate verbally, in writing and perhaps graphically.[35]

In the past at Pepperdine, the Information Systems Coordinator (ISC) positions most closely fit these rather restrictive descriptions. The ISC's are the primary liaisons between Computer Services and the user community.[36] We are presently attempting to train individuals with similar attributes and abilities in the Controller's Office, the Registrar's Office, and in the Office of Institutional Research/ Planning. This circumstance is brought about because of increased user demand and greater ISC involvement in system design and modification.

Communication

It should be obvious, but it does not always seem to be, that there is not and cannot be such a thing as the MIS. There are many different systems which sometimes do and other times do not relate. These systems are designed to provide administrators with information needed in discharging their responsibilities which range from making current decisions about nonrecurrent problems to reporting to government agencies in prescribed formats. The systems are constantly changing, and it is rare to find an administration that is satisfied with its MIS.[37] The authors of this paper contend 1) that the systems that work best are those with the most effective communication channels and 2) that the life blood of planning is communication. The following statement lends support to the contention.

> Communications may be considered at four different levels of analysis. One is intrapersonal, which relates to how an individual takes in, processes, and produces communications. A second is interpersonal, which deals with interactions between individuals and groups. Third, is the flow of communications in channels in organizations, both formally and informally. Fourth, are systems of data flow including computer applications. The more efficient these systems are the better will be implementation of policies and strategies.[38]

The managerial involvement for various levels of administration depicted in Figure 2 has been at least partially designed to facilitate communication at each of the levels mentioned above. The same can be said for the definitions of role functions for the ISC's, the Systems and Planning Ombudsperson, and the new roles being created in the other offices mentioned in the last section of this paper. Various other methods which have met with some success have been implemented to improve communication channels at Pepperdine.[39]

In all honesty, however, it must be stated that one of our ongoing systems problems and one of our real challenges in planning continues to be inappropriate communication.

A final thought regarding communication comes from two axioms set forth by a university president on effective administration.

> The secret cement of any organization is trust. Almost anything will work when enough trust is present. Without it, nothing works.
>
> Use the established channels for action. Haphazard approaches to problem solving breed confusion. Consistency is a form of integrity.[40]

One of the greatest contributors to a breakdown in communication channels must be lack of trust and conversely one of the greatest contributors to building communication channels is consistency. Decision-making obviously based on an established rationale leads to the use of channels which feed data--both formal and informal channels and soft as well as hard data.

Conclusion

The decade of the 80's will be an era of increasing complexity, scarcer resources, and more rapid change. These circumstances will force private institutions of higher education to do more formalized and more effective planning, or they will be hard pressed to survive.

Three key factors which lead to sound decision-making are: 1) significant involvement from all levels of management tying strategic planning, tactical planning, managerial control, and the feedback/modification processes together in a synergistic manner.

2) Systems that are designed to meet organizational needs, i.e., systems that can provide good, accurate, and timely information; and that are adaptable to the needs of the future. 3) A communications network that ties the subsystems together contributing to points one and two by keeping information flowing freely that realistically addresses intrapersonal, interpersonal, organizational and data flow needs.

Planning for the 80's is an activity that requires from management a creative artistry not unlike that of seasoned actors in a play in which the curtain is about to rise but without the cast having benefit of full rehearsal or script--just a vague plot to guide their "ad-libs." Like those actors we in private higher education will wait for audience reaction to determine our ultimate success.

FOOTNOTES

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[32] B. E. Cherrington, "Cost Analysis in Academic Decision Making," Educational Record, Spring 1979, p. 187.

[33] Synnott, Infosystems, p. 78.

[34] Cherrington, Educational Record, p. 188.

[35] Seaman, College and University, p. 9.

[36] For a full description see the previously mentioned Penrod and Craft articles.

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INFORMATION RESOURCE MANAGEMENT:
MEETING THE CHALLENGE

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This is an experientially based paper on how to begin to manage the information resources -- computing, word processing, telephone services, mail services, microfilming, and duplicating services -- in a more integrated fashion. The strategies and tactics being used to overcome tradition, the fiefdom syndrome, and institutional inertia will be discussed.

INFORMATION RESOURCE MANAGEMENT:
MEETING THE CHALLENGE

Introduction

"THE AGE OF THE PAGE IS PAST!" Is that a bizarre and irrational statement? Technologically the answer is no. However, given human behavior and the inertia found in most corporations, specifically within my own institution, such a statement verges on lunacy. Yet, as the self-proclaimed information resource manager for Indiana University, I recently made that statement for publication in the faculty/staff newsletters of several of our eight campuses.

In making such statement I am not promoting the immediate creation of the "Paperless University." Rather, I am attempting to call attention to the arrival of the fourth distinct revolution involving social interchange -- telecommunications. The other three were the advent of speech, writing, and printing.[1]

I envision myself in the role similar to the monk responsible for supplying the ink, quills, and paper for his colleagues in the monastery. He just returned from witnessing the invention of Johann Gutenberg -- called the printing press. He was both excited about the possibility of the printing press serving his colleagues and concerned about their potential resistance to adopting it as a tool to increase their productivity. The monk perceived the implications of the printing press for the primary mission of the monastery, the acquisition and transmission of knowledge. To adopt the printing press as a tool would give the monastery a potential future; not to, would doom it, to death. As the first information resource manager for my institution, I see my overall role as an agent of change combining the attributes of a strategic planner and an evangelist/communicator.

The decade of the 70's witnessed the emergence of the "Age of Computing" in our society. During this decade universities and colleges have developed their computing into an essential resource system to support their research, instruction, and public service (to a minimum degree) missions and their administrative operations. As our society approaches the 21st Century, the whole arena of information technologies -- word, image, graphics, data, and telecommunication processing -- will be more integrated into our way of life. To stay at the forefront in higher education the information resources including computing, word processing, telephone, mail, microfilming, printing/duplicating, and telecommunication services should be planned and managed in an integrated fashion for the institution. Today, I would like to share with you the experience that one major university system is having in organizing the information resource management function. The strategies and tactics being used to overcome the tradition and inertia of the institution will be discussed. The positive and negative impacts on the data processing organization and its style of operation and on the user units will be emphasized. Finally, the results of several task force reports and studies relating to the fit of technological advancements (distributed processing, word processing, message systems, etc.) into the social system of the university will be cited.

The Management Challenge

The challenge for the information resource manager is two dimensional. First, a high quality integrated technical plan for the use of word, data, image, graphics, and telecommunications processing must be strategically developed. This becomes the planning role of the information resource manager in forging the overall technical system for the organization.

Planning in any situation is, at best, a most difficult and complex task. Given the turbulent technological environment, planning might be perceived as impossible in integrating the information technologies cited. Independently each of these technologies has its own unique history of development and is currently at a different stage in its evolution. For example, contrast one of the newer technologies like word processing with that of telephone voice processing. Meshing these technologies into an overall technical system calls for an unqiue approach in the planning function.

In my presentation to CAUSE in 1976, I described my approach to strategic planning, which is heavily based on the work of Russell Ackoff. It deserves mentioning again. Russell Ackoff described three approaches to planning, two of which are vital to understanding the framework of strategic planning in the information resource area -- satisficing and adaptivizing.

In satisficing planning, an attempt is made to minimize the number and magnitude of departures from the current policies and practices. Only modest increases in resource requirements are recommended and there are not any large changes in organizational structure. The satisficing planner tends to enter the future facing the past and is preoccupied with one resource, money. Satisficing planning seldom produces a radical departure from the past and usually yields conservative plans which continue most current policies, correcting only obvious deficiencies.[2]

Adaptive planning is based on the principal value that planning does not lie in the documents produced, but in the process of producing a plan. The planning objective is to design an organization and a social system for managing that will minimize the future need for retrospective planning. Based on the knowledge that the future carries certainty, uncertainty, and ignorance, adaptive planning involves the dimensions of commitment, contingency, and responsiveness. Adaptive planning recognizes that some apsects of the future are virtually certain, in which cases the primary need is for a commitment to a continuous updating of the estimates of what is inevitable or is unchanging and required. There are certain aspects about the future which we cannot be certain, but which we can be reasonably sure of the possibilities. In these cases we use contingency planning to prepare for each eventuality so that we can quickly exploit the opportunities that are presented when the future presents itself. Finally, there are aspects about the future which we cannot anticipate, including technological breakthroughs, political upheavals, and natural phenomena. In these cases responsiveness planning needs to be incorporated. Responsiveness planning is directed toward designing an organization and a system for managing which can quickly detect deviations from the expected and respond to them effectively.

The adaptive planner tries to change the system in a way that will make more efficient behavior follow naturally. Adaptive planning requires an understanding of the dynamics of values -- the way values relate to needs and their satisfaction of how changes in needs produce changes in values and what produces changes in needs.[3]

As the information resource manager, the natural question becomes, how do you present a comprehensive, cohesive, and integrated long range technical plan for the institution. The answer is you don't. What you seek to achieve is the inculcation of the planning process which will enable you and other managers in the institution to deal effectively with the certainty, uncertainty, and ignorance. I hope to illustrate how this planning approach is evolving at Indiana University.

The second dimension of the challenge for the information resource manager is to be able to mesh the technical plan with the organization's social system in order to develop an effective social-technical system which fulfills its missions and goals. A high quality technical system is an absolute must, but without organizational acceptance it will be a bust. Thus, the information resource manager in dealing with the social system must perform the role of evangelist/communicator. In putting together the two systems, the information resource manager must be an effective manager.

Three years ago I described the actors in the social system in a trinary fashion -- zeros, ones, and others. Today, I would update those descriptions as follows: the zeros are those individuals who do not trust any new technology. They would rather process all information using pencil and paper. You can spot them by their green eyeshades and tennis shoes. No amount of evangelism or communications will change their behavior; therefore, ignore them.

The ones are zealots who wish to use all the latest technologies. They are also easily identified by the gadgets in their offices, homes, cars, or on their person. The ones are immediate disciples for the information revolution and if properly exploited and harnessed for the cause at hand can be valuable assets.

The others, now referred to as eights, present the real challenge to the information resource manager's evangelistic/communication prowess. They are individuals usually interested in the new technology and open to its potential uses. However, they are often not knowledgeable about the technology nor are they easily motivated to learn about it. Often times they are cautious about any changes in the work system or social system of the organization. There is the additional problem in that many zeros come disguised as eights.[4]

As the information resource manager, you must capture the enthusiasm of the ones and channel their energies to be consistent with the technical plan. More importantly, you must gain the acceptance and commitment of the eights to open up the possibility that the basic fabric of their social system may change as a result of introducing new information technologies.

It is human nature to resist change. The second challenge for the information resource manager is to implement change which entails overcoming resistance to it. According to Kotter and Schlesinger there are four basic reasons for people to resist change and there are various methods for dealing with each type resistance. People resist change: 1) when they do not understand its implications and perceive the costs greater than the gains to them; 2) when they assess the situation differently; 3) because they fear they will not be able to develop the new skills and behaviors required of them; and, 4) when they think they will lose something of value as a result. To deal with these various forms of resistance the same authors suggest the following strategies: 1) educate the people to the change beforehand; 2) involve potential resistors in some aspect of design; 3) provide facilitation and support in form of training or time off after a difficult period or just listen; 4) offer incentives and negotiate with potential resistors; 5) manipulate situations to influence others; and, 6) use explicit and implicit coercion. One must pick the appropriate strategy in a given situation and that may depend on amount and kind of resistance, position of the initiator vis a vis resistors, the data available, and the stakes involved. Changes which ignore these factors usually run into problems.[5]

Where does the person called the information resource manager find advice from experts who have employed successful models, strategies, and techniques in similar endeavors? Jack I. Epstein, Booze,Allen, and Hamilton, New York, best describes the current status for most organizations and individuals involved in developing total information resources. In an interview with Infosystems, Epstein suggested the emergence of a new job function within a corporation called the information resource manager. The position is part of "Office of the Future" that uses information technologies to support human processing -- the ability of a person to acquire, assemble, and act upon knowledge. Epstein indicated that most corporations generally agree and have focused their need on the concern for such a position, but there has been no complete job description developed to serve as a model. Nor has any organization been able to develop a single human information processing support system, because no one quite knows how to pull it off. He views the information resource manager as needing to cope with and to tie together the organization's multifaceted and loosely connected information systems into a singular whole. Thus the position involves all the technologies mentioned earlier. The task, according to Epstein, is as much political and it is technical because the concept treads on various sensitive issues and threatens the traditional office relationships and design of the organization.[6]

Given that observation about the general state of the art of information resource management, the purpose of the remaining part of this presentation is to share with you one practical experience, one self-proclaimed information resource manager, and one institution have had in attempting such an undertaking.

Environmental Setting

The complexity of Indiana University's environmental setting is vital to your understanding the experience we have accrued to date. Indiana University is an eight campus system consisting of over 76,000 students. Enrollments on the campuses range from 1,400 to 32,000. The missions of the eight campuses range from a singular emphasis on teaching to a shared emphasis on teaching, research, and public service. There are two research based campuses -- one is Indiana University-Purdue University at Indianapolis, an urban commuter institution with professional school thrusts especially in medical and health sciences. Bloomington, the flagship campus, is residential emphasizing the arts and sciences and professional schools. Of the six regional campuses, five are four-year and one is two-year. One of the four-year institutions is a shared campus with and managed by Purdue University. The management style of Indiana University may be characterized as historically centralized, but evolving toward greater decentralization at the operations level.

Indiana University's budget for 1979-80 is approximately $500 million. It is estimated that the funds spent in the various information technologies total $44.3 million of 8.9 percent. Centralized computing within the Indiana University Computing Network plus the Indiana University Hospitals totals $9.3 million, or 1.9 percent; telephone services are estimated at $6.3 million, or 1.3 percent; an estimated 2,500 clerical people are involved in some form of word processing at $22 million, or 4.4 percent; $2.0 million are spent for mail services, or .04 percent; $1.2 million are projected for duplicating services, or .02 percent; the Indiana University Printing Plant is budgeted at $2.5 million, or .05 percent; and telecommunications (exclusive of the Indiana Higher Education

Telecommunication System) is budgeted for $1 million, or .02 percent of the total institution's budget.[7]

The planning and management responsibilities for these information processing areas are dispersed. That is why I said earlier that I am a self-proclaimed information resource manager for Indiana University. In fact, only the computing, academic and administrative, exclusive of the I. U. Hospitals, falls under my direct authority for planning and management. The prospect of merging all of these information processing areas under one management umbrella is almost nil for political reasons and may not be desirable from the management perspective.

How then is Indiana University approaching the challenges of developing an integrated technical plan and gaining its organizational acceptance in order to evolve toward an overall improved effectiveness in its social-technical system? The management of the Indiana University Computing Network has taken the leadership role in this effort and we are starting with what we already control -- computing and what we can significantly influence in the immediate future -- word processing. While telephone, mail, duplicating, printing, and telecommunication services offer fertile fields for integration and need ultimately to be integrated, the fact that they are not under one management control legislates against immediate active involvement. We are cognizant of their ultimate need to fit into the overall integrated technical plan. Thus, we are making provisions for later inclusion. Also, if any opportunity arises to include facets of these areas now they are exploited, we do want such inclusions to be at the initiative of the managers in those areas.

Adaptive Planning at Indiana University

As stated earlier, adaptive planning is designed to focus on future prospects while reducing the need for removing past deficiencies. Adaptive planning consists of three distinct strategies. In dealing with future certainty, there is the need for commitment planning; in dealing with future uncertainties, there is the need for contingency planning; and for dealing with future unknowns such as natural, political, or technological changes and upheavals, there is the need for responsiveness planning. Over the past three years at Indiana University, we have employed all three strategies in adaptive planning as they properly relate to the integration of computing and word processing technologies.

In 1976, a hardware task force studied and recommended a three year computing hardware plan for the Indiana University Computing Network. This plan was aimed at meeting the projected ongoing academic computing needs of the University and was in essence an extension of the current hardware configurations in place at that time. At that time the Indiana University Computing Network consisted of three major computing centers, two located in Bloomington and one located in Indianapolis to serve both the academic and administrative needs. In 1976 the Wrubel Computing Center, one of the acadmeic computing centers, located in Bloomington had a CDC 6600; today it also has a Cyber 172. IUPUI Computing Services, our second academic center, consisted of a DEC 10 in 1976. It has expanded its interactive capability since that time. Finally, Data Systems and Services, the administrative computing center, consisted of an IBM 370/158 which has been expanded to an IBM 370/158 attached processor system.

Through a cycle of commitment planning this hardware plan set forth in 1976 has been modestly adjusted to meet slight variations in the projected needs. This commitment planning cycle has a very consistent pattern. In

January prior to an upcoming fiscal year, each center director submits an updated hardware plan based on an examination of the changes and shifts in the use of the computing resource that had occurred over the previous 18 months. These hardware plans are then subject to changes as a result of the budget guidelines. Once the budget is firmly locked into place, usually in May, the hardware plan becomes official for another year. Hardware acquisitions then proceed on course. The cycle repeats itself again in the subsequent year.

While the 1976 hardware task force made its recommendations for continued growth of the central sites, it was cognizant of the emergence of the mini/microcomputing phenomenon. An additional recommendation was made to conduct a special study to determine the impact minis and micros would have on the academic computing needs of the institution. In the fall of 1976, a small study group was established consisting of one representative from the Wrubel Computing Center and one from IUPUI Computing Services along with one user from Bloomington and one from IUPUI to study and to make recommendations on the institution's response to the mini/micro phenomenon. Thus, we established a responsiveness planning effort. Very early in this effort it appeared that the needs of the IUPUI campus would be quite different than those at Bloomington; therefore, subgroups were formed to examine specific campus needs. Hence, within this responsiveness planning effort we developed a contingency planning effort for the campus. The results of the two studies did support the assumption that the micro/mini needs on the two campuses were quite different. For Bloomington the primary need was real time data collection and pass-through capability to the central host at the Wrubel Computing Center. This resulted in a recommendation to establish a Small Computer Support Group Facility to coordinate the development of mini/micros on the campus. In contrast, the mini/micro phenomenon at IUPUI was primarily going in a self-contained stand-alone direction for the collection and analysis within specific research units. Rather than establish centralized small computer support group, the support responsibility was assigned to the individual research units with overall high level consulting service coming from IUPUI Computing Services.

In September 1977, there was an emerging attitude among the six regional campuses of the need for some stand-alone computing capability to respond to the growing academic computing usage and to some local administrative computing needs. The computing center directors of the six campuses were formed into a task force to examine the user needs of the regional campuses in these areas and to plan a technical solution utilizing minicomputing. Between September 1977 and May 1979 this group studied the needs of the campuses, examined a variety of vendor alternatives, and made a selection of a specific minicomputer configuration and vendor. In June 1979, my office made a presentation to the six chancellors indicating that we endorsed proceeding with stand-alone capability at four of the regional campuses immediately and for the other two later, because of their size and need at the present time. All the chancellors endorsed the concept of securing stand-alone computing capability. However, only one campus has subsequently come forth with the funding with the plan for implementation of their minicomputer in December. The others will happen 18 to 24 months in the future based on funds being available. In essence,this can be classified as a contingency planning effort.

To date, the most outstanding example of responsiveness planning has been in the area of word processing. In June 1978, there was a burgeoning number of requests for word processing equipment coming to my office for approval. All computer equipment throughout the institution and anything that looks like computer equipment is approved by my office before going to purchasing.

Seizing an opportunity for the institution to respond to this technological breakthrough and its relatedness to data processing, my office immediately took the initiative to get a planning effort launched. The first step was to write to my vice president indicating a concern for the potential of word processing and the need to plan for it. I suggested that if I did not hear from him within 10 days my office would assume responsibility for moving ahead. A task force, consisting of individuals representing various administrative units throughout the institution, the computing network,and the purchasing office was formed. The task force started its work in mid-June and submitted a final report in October 1978. The final report included seventeen recommendations. The most important recommendation was to have the University adopt a goal of improving effectiveness of office support services throughout the institution by the use of word processing technology. Another important recommendation was to establish an office to oversee the planning and development of word processing for the administration of the institution. Some task force members suggested a new office, others wanted my office. Since no specific recommendation was made on location, my office assumed the responsibility.

The final report and recommendations were submitted to the President's Council for review in late October. By February, when no official position had been taken by the President's Council, I requested permission from the vice president to circulate the report to the deans and department heads throughout the institution for remarks and comments. By May, 1979, I had received no major comments.

In my 1979-80 budget proposal, I requested $100,000 to establish a planning and consulting group within the Management Systems department to launch the effort in word processing for the institution. The funding was not forthcoming. Consequently, we ended up carving the resource out of the Management Systems department, reducing our commitment to administrative systems development. The office systems planning and consulting support group, consisting of two analysts, has been in existence for the past five months. It appears to be working out quite well in terms of facilitating the development of word processing in a coordinated fashion. Technical guidelines for the acquisition of equipment have been adopted.

Indiana University has taken the approach of decentralizing word processing, while providing for the integration of word processing and data processing where appropriate. All acquisitions of word processing provide for the future possibility of integration into the Computer Network. This responsiveness planning strategy for word processing has resulted in the planning and control becoming part of my portfolio; albeit by default or by initiative.

During this past year the management of the Indiana University Computing Network has been confronted with two negative top level decisions concerning administrative and academic computing hardware plans for the future. Administratively, in January 1979 we had proposed moving ahead with our plan to replace the IBM 370/158 AP with an IBM 3033. In spite of a severe capacity problem, the President's Council turned down the proposal because it would not have been politically advisable to reallocate funds when faculty and staff were faced with only modest salary increases.

Instead of viewing that decision as negative, we elected to see it as an opportunity to take a fresh look at our future administrative information needs. After all, it had been 1972-73 when we last had done a comprehensive information systems planning effort for the total institution. Rather than having this planning effort focus on the total institution, we have decided on a more modular approach. Twelve information system categories have been identified. Specific systems in each of these categories will be viewed as having an university-wide thrust or a specific geographic thrust. A business system planning similar to what IBM promotes, will be conducted in each system category. We have just finished our first -- auxiliary enterprises specifically for the Bloomington campus. Others planned for this year include the all - university alumni system, registration/student records for IUPUI, and the same for regional campuses.

It is very likely that these information systems planning efforts will lead to a more modular approach to our future hardware planning. That remains to be determined. For now, we have just completed a contingency planning effort for administrative computing hardware. For a two-year period we will replace the 370/158 with a third party leased IBM 370/168. This move, to take place at Christmas, buys capacity and time. Plus it enables us to accrue some capital funds for future hardware.

At the same time the negative decision was made on the administrative computing hardware, the President's Council also decided we could no longer finance the purchase of academic computing hardware with long term internal borrowing -- a procedure instituted in 1970. With a $3.0 million internal loan already in place and a plan which called for increasing that loan to between $8.0 and $9.0 million by 1981-82 we found ourselves in a very awkward position. Again, we viewed that decision as an opportunity to shift directions for academic computing for all campuses. Like the regional campuses, the Bloomington and IUPUI campuses had begun to express interests for more distributed interactive computing. Also, there had been growing, but not yet measured, needs for IBM type computing for academic users,for access to external data bases,and for larger numerical analysis capability than we have in the Computing Network.

We are currently in a contingency planning mode for hardware at IUPUI and the Wrubel Computing Center to cover our needs for the next two to four years while we launch a more comprehensive long range planning effort.

Ironically, our long range planning effort has the impetus by the recent interest of the Indiana Higher Education Commission in having academic program improvement requests for the 1981-83 biennial budget which emphasize computing needs.. Consequently, this past summer we launched our largest responsiveness planning effort yet.

We are working with a wide range of academic units throughout the institution to develop program improvement requests which can be integrated into a request for each campus which will be satisfied by local Computing Network hardware. We anticipate completing this project next summer with a multi-million dollar program improvement request for 1981-83. Our requests will call for base budget increases to cover operations and hardware and some one time funding for major hardware acquisitions.

What I have shared about our planning may appear to be a mess to you. True, today we have no document to give you which articulates the long range technical plan. However, I do contend we have an adaptive planning process which has been extremely effective and has been inculcated the fabric of the Indiana University Computing Network and amongst its users. We have maintained our commitment planning effort since 1976. We have responded to contingencies and have capitalized on technological breakthroughs and political decisions with responsiveness planning. We are in a transition period and have developed solid transition plans which will enable us to focus on long range planning in computing and word processing with attention to their integration.

Managing Technological Changes at Indiana University

A plan which introduces new technology must be adapted to and by the social system of an organization. A high quality technical solution to a problem will fail if it does not fit an organization's social system. However, any plan will necessarily be accompanied by adjustments to the social system.

Thus the information resource manager must evangelize, communicate, and effectively manage the resistance to change using different strategies for different situations.

At Indiana University we have had a mixed experience in managing changes. Some changes have occurred rather smoothly while others have taken explicit coercion to bring about. A couple examples might help your understanding of our experience.

When we introduced interactive computing to the academic community in 1973-74 we had two different reactions. At IUPUI, there was overwhelming acceptance from the top of the organization down to the individual user. Getting space to establish cluster terminals was no problem. A major reason for this acceptance can be attributed to the lack of a tradition and history of computing.

At the same time people in critical positions on the Bloomington campus resisted interactive computing. A major reason was the perception that it was an inefficient use of the computer power. It took a couple years to break that resistance.

On the administrative side we have had numerous incidents of resistance to change. In 1973 we began developing on-line systems. When we began implementing them we found resistance in both computer operations and the user departments. In fact, on-line usage was not referred to as production until 1977. Today, we have mixed reactions whenever any new system is implemented pointing out a deficiency in preparing people for the impending change.

Recently, we have launched a number of activities designed to deal with resistance to change. Most of these efforts have been with administrative computing users. We have always had fewer problems with academic users.

In the area of education and communication, we have a three pronged attack. For the top level management of the institution a series of executive briefings are being conducted; short conceptual or position papers (The Future of Information Resource Management at Indiana University, July 1979) are circulated; and brief articles from journals are sent periodically.

For the deans and major department heads a series of visitations and briefings are being scheduled. They receive special reports and task force studies. Also, they receive reports on utilization. Currently, we are working on a program to improve data/information retrieval services for them as users. Finally, we are providing the leadership in developing the program improvement requests in their respective schools, including designing a model request format and providing technical writing assistance.

For the users, seminars and skill training classes have been increased. As an example, we conduct annual seminar with IBM on technological issues of interest to users and data processors. For academic users we have a series of seminars and each spring an instructional computing conference with contributed papers.

In the area of facilitation and participation in design and change of systems, we have had the normal fare of task forces and committees. We are now reworking our whole concept of how our clientele participate. Administratively we now define our clientele as customers or users. Customers are those managers responsible for the well being of a system on behalf of the university. Users are those managers and faculty who need access to data from various systems to make decisions for their respective units. Whereas we used to have task forces in the design of a system, we now have our Management Systems personnel deal with a customer executive or designee.

Manipulation and coercion are still part of our arsenal, but we hope to minimize the need to use such strategies. However, I am not opposed to using them when the best interests of the institution are at stake.

The Future

As the information resource manager, still self-proclaimed, it is my responsibility to continue to be an agent for change. This involves uncovering the inevitable, determining how to exploit, and giving credit to those who participated in making it happen.

The stage is now set at Indiana University to expand the adaptive planning effort which has been going on in computing since 1976 and in word processing for the past year and to ultimately include all the other technologies involved in information processing. The first step is to recommend establishing a top level task force to begin the work of articulating a plan for integrating these areas into a technical plan for the institution. It will not be an easy assignment and will necessarily take one or more persons working on it full-time.

We must also continue to expand and make more effective our communications role. We must be zealous proponents of the information technologies on behalf of the institution.

As I have stated many times to my colleagues, "The quality of Indiana University in the year 2000 will be in large measure determined by its effective uses of the information technologies which exist today. Our customers, the students expect it. We must meet the challenge."

FOOTNOTES

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Left Brain Systems and Right Brain Managers

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An Educational Management Information System (MIS) intends to support activities of academic managers in timely and supportive ways. A fundamental dichotomy between the nature of such systems and the nature of academic management tends to delimit the potential timely support of an MIS. An academic MIS features sequential, discrete, and systematic structures. Such features characterize qualities some authors refer to as "left brain" functions. Managerial activities, however, stress judgmental, value-oriented, conceptual, and wholistic patterns, patterns frequently referred to as "right brain" functions. MIS developers and advocates tend to impose logical structures on managerial activities, particularly decision making activities. MIS critics point to a host of managerial activities and decisions seemingly unaffected by any MIS or unrelated to any MIS.

This paper argues that the academic MIS should be designed and used recognizing both "left brain" and "right brain" managerial functions. The paper illustrates and describes some alternative applications of this argument, particularly stressing that the end result of a comprehensive MIS should include synthetic knowledge adequate to inform the whole breadth of management activities. In longer term consideration, the paper suggests the need for information systems which simultaneously consider varieties of information using graphic and pattern recognition techniques.

Left Brain Systems and Right Brain Managers

Even the staunchest advocates for management information systems in higher education have lamented the persistent disparity between the potential and the performance of higher educational applications of MIS. Laments appear in many forms. Some identify the crisis as the inability of academic managers and academic technicians to communicate effectively about system capabilities and management tasks. Others decry the technical or substantive limitations inherent in any MIS. Yet others take small comfort from the peculiarities of the higher educational environment itself, with its professed non-managerial character and overweaning adherence to Byzantine governance structures. Whatever dirge the MIS advocate adopts, he will join a group of colleagues mutually frustrated that the potential utility of the MIS in higher education remains latent and undeveloped. Both managers in higher education and the MIS advocates would cheerfully welcome the news that a different approach to MIS might bridge the chasm between the promise of MIS and the dismal reality of managerial problems facing higher education in the decade of the eighties.

The topic we have chosen to discuss does not promise to build a bridge across the chasm. We do intend to suggest a major explanation of the chasm and we hope to present some ways in which existing MIS's or parts of MIS's may be properly used to address the grim realities facing academic management in the eighties, presuming that some academic managers actually will confront those realities and opportunities using the best resources available to them. We wish to portray a dichotomy between the nature of management information systems and the nature of academic managers. We hope to suggest some strategies to build bridges between the academic MIS developer and the academic manager. We seek the development of better institutions of higher education through the proper use of MIS by academic managers.

By design, an academic MIS addresses the support of various academic managers in a variety of tasks. The design of these supports may range from reasonably well-defined and circumscribed tasks such as student registration or faculty payroll to more global and unstructured matters such as enrollment forecasting or long range planning. Whatever the specific activity supported, academic MIS's tend to display certain common elements. By definition, an MIS includes:

- a set of inputs, primarily data elements and definitions, organizing structures, and the technical and human resources needed to obtain data;
- processes necessary to conduct data analysis and manipulation and procedures that govern the overall operation of the system and its interface with users and other systems;
- outputs, primarily data that have been transformed into information and presented in ways designed to be helpful to one or more management users.

These elements may be more or less formal, explicit, and comprehensive depending upon the purpose, nature, and developmental history of the MIS in which they lie embedded. Such variations do not change the fact that these elements define the fundamental structures of any academic MIS. Furthermore, these same elements provide organizing principles for the bulk of MIS development efforts.

Reflecting on the presuppositions of these basic MIS elements presents one side of the problematic dichotomy referred to earlier. The building blocks of an educational MIS tend to be discrete entities linked together in some logical and orderly fashion. Individual data elements, procedures for carrying out specific data processing or analytical steps, and the information items incorporated in output reports all consist of separately identifiable units. The more formal and comprehensive the MIS, the more readily apparent this separability becomes. In a computer-based MIS, identifying the component parts of the system in a very detailed fashion absolutely becomes an operational necessity. Similarly, the operating procedures which link these discrete units tend to be divisible, identified with specific purposes, and inherently sequential in nature. While these procedural traits become amply evident in computerized systems, they may be readily discerned in all but the most informal management information systems.

These characteristics of an MIS--discrete data elements, sequential processing, and rational structures--correspond to a type of thinking that some psychologists have come to describe as "left brain" functions. According to this paradigm, the left brain directs those activities and actions usually labeled as "rational", "scientific", or some similar description. In our judgment, educational MIS's owe their birth, development, and maintenance to a vast host of well-intentioned, left brain dominated thinkers.

By contrast, educational managers (and perhaps managers generally) rely on frequent exercise of functions of the "right brain." Within the "left brain/right brain" paradigm, the right brain shuns the analytical, linear, sequential tasks and devotes itself to intuitional, simultaneous, relational, and holistic tasks. Consideration of the tasks of academic managers should quickly reveal why right brain activities play an important role. Academic managers operate in an environment characterized by uncertainty, diverse and conflicting value positions, and complex human organization relationships. The academic manager must exercise professional and personal judgment, rely on intuition in the absence of clear facts, and process simultaneously a wide variety of tangible and intangible factors in selecting a course of action. These typical judgmental situations place heavy stress on those activities paradigmatically described as right brain activities.

In sum, the intended audience of an MIS, the managers, rely extensively on right brain processing. The developers of MIS, and the MIS itself, address left brain processing. To state the dichotomy sharply in terms of an analogy: no matter how well crafted and how attractive a left-footed shoe may be, in no way can it solve the problem of an unclad right foot. In the same way, perhaps, no matter how sophisticated, how comprehensive, how elegant a left brained MIS may be crafted, it may never respond to the right brained needs of the academic manager. If the shoe doesn't fit, it won't be worn.

System development strategies for the typical academic MIS compound these difficulties. Briefly stated, MIS developers (and MIS advocates) usually attempt to confront managerial activities by imposing some kind of logical and unitized structure upon those activities, particularly the decision-making tasks. This approach, in effect, ignores the right-brain nature of management and tries to view both system and manager in left-brain terms. That the MIS designed under this premise fails to meet managerial needs or to impact managerial decisions in any perceptible way should occasion no particular surprise. But repeated failures of this technique have not succeeded in terminating the quest for the ultimate academic MIS.

Persistent MIS developers try a variety of avenues in their quest. One common approach seeks to develop the MIS from the standpoint of management functions. This rubic divides managerial activities into a series of interrelated tasks: planning, organizing, staffing, directing, and controlling (or some similar analytical categories). The component functions then serve as the focus for identifying the objectives to be served by the MIS and the specific data elements that should be included. The key assumption in this approach depends on the proposition that management can be sorted into a set of relatively discrete tasks and that these tasks can be used to define the needs an MIS attempts to serve. This approach, characterized by its analytical, sequential methodology seems almost prototypical of the left brain perspective.

Other strategies for MIS development focus more directly on the information requirements a system may be designed to satisfy. Information requirements analysis usually employs either the data analysis method or the decision analysis method. The former approach involves an examination of all formal information sources used by an academic manager, review of the full set of information items currently available, identification of items that constitute unnecessary or redundant information, and the specification of new information items needed to fulfill currently unmet needs. Such attention to discrete information items naturally leads developers away from the tasks of right brained managers.

A similar strategy with somewhat different concerns attempts to create the MIS from a perspective of decision analysis. This method involves delineation of the specific decisions that managers make, the identification and modeling (usually in flow chart form) of the component steps involved in each decision, and the linking of information items to each sub-step in the decision-making process. The imposition of the left brain system philosophy upon the right brain world of academic managers appears no more dramatically than in the decision analysis method. Infrequently can academic managers even identify such textbook-like discrete decisions, much less separate them into component parts. Without this identification, much of the basis for specifying information items that should be captured by the MIS remains unknown. In many ways, this situation typifies the dilemma posed by the conflict between left brain systems development and right brain management needs.

We have attempted to use the left brain/right brain paradigm to illumine some of the many practical problems in bringing MIS to higher education. Of course, we can conceive of many circumstances in which both left brain and right brain functions may be used simultaneously. A musician listening to Beethoven's Fifth Symphony may, at the same time, understand the work in terms of its discrete notes, its rhythms, and its instrumentation while holistically, simultaneously, and relationally understand the esthetic beauty of the composition. The human artifact we call knowledge consists both of linear, sequential, and analytical elements as well as simultaneous, relational, and holistic elements. The best way to bridge the chasm between the left brained MIS designers and the right brained managers lies in understanding that the greatest potential for MIS in academia may be its ability to uncover new knowledge about higher education and its institutions.

A major achievement of MIS in higher education has been to bring structure to chaotic masses of discrete data. Analysis has led to better understanding of which bits of data are significant and why. Rationality has imposed some order and definition on that data. In logical fashion, data elements have been organized to yield useful information. MIS, at least in many places where successfully implemented, has succeeded in transforming data into information. In the process, it has improved operations at the middle operational levels of higher educational institutions and improved performance of middle level managers.

But MIS in higher education has not affected upper level management because it has not yet successfully transformed information into knowledge. Decision making, we posit, rests more on a basis of knowledge and less on a basis of information. However, we judge that creatively conceived information might serve as a basis, among many other bases, which might reveal more accurate and comprehensive understanding of higher education and its institutions and hence profoundly affect the quality of decision making, while incidentally lending a major impetus to the development and use of MIS in higher education.

An illustration may help. One might have in hand a complete set of information about events in the United States between 1860 and 1865. All that information still would not necessarily produce knowledge and understanding of the American Civil War. That task of understanding requires a historian to select and order the various bodies of information, and relating that information within a conceptual scheme which satisfies, temporarily at least, our quest for understanding.

A further example, drawn from the domain of higher educational MIS, may be more helpful. Do you recall RRPM, the Resource Requirements Prediction Model? One imagines an enterprising left brained task force seeking to affect managerial decisions. The task force addresses problems facing hypothetical managers who need to know how many new resources to order from the legislature to cope with anticipated growth in student enrollment. Now, surely, those final reports yield all the information, no more and no less, that will be required to make a sequential, analytical decision. One wonders what their reaction might be to discover that their sequential analytical device has fallen into the hands of a right brained academic manager who uses the information to come to new knowledge about the interdependence of component parts of his institution. When faced with a decision forced by the simultaneous appearance of two rival chairman in his office, he doesn't order a new run of RRPM with the addition of eight new variables, but relies on his holistic, simultaneous understanding of his institution coupled with an experienced intuition of the organizational politics involved. Such uses of left brain systems by right brain managers might affect the incremental decisions within an institution profoundly yet never be uncovered by the decision analysts.

Having suggested that the proper way to bridge the chasm between the left brained management systems designers and the right brained managers lies in seeking knowledge rather than merely information, and having illustrated that proposition briefly, we would be delighted to be able to unveil our new Management Knowledge System (MKS) for higher education. Unfortunately, defining knowledge in a universally accepted fashion presents far greater difficulties than defining data or information. We make no claims, even provisionally, for capturing full knowledge and understanding of higher education and its institutions within a satisfying conceptual scheme.

We do propose a reuniting of the two hemispheres of our collective minds in pursuing the development of the educational MIS. Both left brain analysis and right brain syntheses can lead to knowledge and understanding. MIS developers need not renounce their past and begin anew; academic managers need not cast away their holistic modes of behavior. Rather, the analytical MIS developer must ask of his systematized information, "What does this information mean?" The synthetic academic manager must realize that information flows, data sets, and computer outputs may lead to fuller knowledge and understanding of institutions when studied carefully. The promise of MIS in higher education will remain unfulfilled until the MIS serves to produce new knowledge and until academic managers seek to inform their decisions with comprehensive understanding.

EMPLOYEE RETENTION IN THE 1980'S

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Universities are facing difficult times in the retention of data processing employees due to the decrease in the cost of computer equipment and the increase in the demand for programmer/analysts. Because of budget restrictions, many universities cannot adequately compete with industry for qualified professionals. University D. P. managers may, however, retain their employees through recognition of their needs, and motivational efforts to satisfy those needs.

EMPLOYEE RETENTION IN THE 1980'S

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Introduction

As a new decade begins, the future of the data processing community is certainly one of more industry-wide expansion, lower costs of hardware, higher costs of personnel, and a proliferation of computers into businesses and homes. In short, the 80's will be a decade of boom years for D. P.

For those of us who are university administrators in data processing this expansion poses problems, especially in state-supported institutions. With universities finding their budgets decreasing or minimally increasing, the salaries we can offer our D.P. professionals are often not very competitive. Our financial committment to data processing personnel will be even less effective because of the many opportunities available on the outside for our D.P. staff. The increased cost of living in recent years has underscored the discrepancy.

The coming proliferation of minis and micros in the business environment will also provide more opportunities for employee movement away from universities. As the machinery population grows, this demand for D.P. personnel is sure to drive up the cost of retaining them.

D.P. managers must also be aware of the growing female working population. Data processing is an area equally open to men and women, and women are becoming more of a factor in the determination and fulfillment of human needs necessary to maintain a high standard of living.

Employees' needs

In an effort to keep our valuable personnel resource with the university, we, as managers, must appeal to other values and needs of employees. We must make them stay with us for reasons other than money, although money is always a factor.

What drives employees? Why do people work? Most often the response to these questions is "money." Surely, one must earn money to live, to survive, and to enjoy life, but we must also recognize that once these basic necessities are all fulfilled, that is, we are all living, surviving, and enjoying life to some extent, then our needs are changed. One is thirsty until he has drunk, and then he has other needs.

The difficulty administrators must deal with is how much money does he actually require to survive and enjoy life; and, beyond that, what can we offer him to make up the rest of his needs?

Abraham Maslow's hierarchy of needs is a simple statement of common sense that few people realize until it is introduced to them. Maslow defined five types or categories of needs pertaining to humans at work (Exhibit 1). The first of these types is the physiological need, that of requiring certain basic things like food, clothing, and shelter. Among the hard-core unemployed and itinerant workers the physiological needs are usually the greatest. Their reason for working, or at least looking for work, is to provide themselves with these essentials for living.

The second level of need Maslow identifies is safety or security, that is, protection from being fired, demoted, and from economic disaster. These needs become predominant when the physiological needs are somewhat satisfied. Job security, fringe benefits, retirement plans are examples of ways in which these safety needs are satisfied.

Maslow's third category of need, which becomes predominant only when the first two are somewhat satisfied, is social. Man needs to have social interaction with his fellow man so that he can share his work and play. He has little need for social interaction until his physiological and safety needs are at an acceptable level of satisfaction.

The fourth category is esteem. Once man has accomplished the three previous needs to some satisfactory extent, he then needs to rise above his peers and be recognized for superior efforts or exceptional talent. Notice that this is a shift from the preoccupation with the environment to the content of the work itself. It is not the environmental characteristics that are to be considered most important, but the actual job being done. The employee derives prestige from doing superior work and being recognized for it. His concern at this point is not "to make a living" but to "keep up with the Joneses."

Once a person has satisfied these four needs his attention turns toward self-actualization, the fifth level of need determined by Maslow. Basicly, two motives lead to a feeling of self-actualization: competence and achievement. Once a person has achieved the goal he has set for himself and has proven his competence, he has accomplished success as defined by his own standards. He continues to pursue self-actualization through forces which drive him to maintain his stature and class.

As their economy becomes more middle- to upper-middle class our employees are practically guaranteed satisfaction of safety and physiological needs. Therefore, workers of today are looking for more social interaction, esteem, and self-actualization in their jobs rather than safety and physiological needs.

Management must recognize the strength of each of these need levels for their employees and strive to provide the necessary incentives to satisfy them. Unfortunately many managers are not attuned to the needs of their employees. Rather, they view the employee as simply a body for hire.

At U. S. L. the programmer/analysts' needs are reflected in a survey conducted in July of 1979. The employees were asked to rate ten categories of job-related items in order of importance. The results of the combined responses produced the following: (Exhibit 2)

They demanded good working conditions, recognition for their efforts, loyalty of their supervisors, and interesting work. Good wages was rated fifth. Promotion and growth was not considered as important by this particular group. Feeling "in on things" ranked seventh, showing a lack of interest in social interaction. Tactful disciplining, job security, and personal problems were rated last probably because these categories are not very applicable to our situation. Also, the security need is fulfilled through our civil service system.

In obtaining feedback through surveys like this one, supervisors can have a feeling for what needs are most important to their employees and can begin to take positive steps to fulfill those needs.

Leadership styles

For our purposes, management styles and leadership behavior may be broken down into two categories: "the autocrat", who gives orders and demands that the employees obey them without question; and "the democrat", who relies on his employees to make the decisions within the limits set by him. Exhibit 3 shows this as depicted by Robert Tannenbaum and Warren H. Schmidt. As a manager moves toward democratic behavior, his employees have more voice in decision-making and he accepts their input in arriving at a decision. This is related to Douglas MacGregor's Theory X and Theory Y. MacGregor defined a set of assumptions dealing with management styles with Theory X on one end and Theory Y on the other (Exhibit 4). Theory X holds that an employee is born lazy and must be whipped, kicked, or otherwise coerced into working. He needs to be closely supervised and directly controlled. Theory Y contends that work is as natural to man as play and that man needs and wants to work. The former may bring to mind the days before and during the industrial revolution when the boss was the boss and an employee was glad to have his job because he had to live. Managers of this type are strict disciplinarians and authoritarians who look upon the work force as a mob of unorganized workers holding safety and physiological needs above all others.

Theory Y, on the other hand, provides the employee with the freedom to work because he WANTS to, and gives him the support and freedom to work at his own pace. This theory maintains that man wants to work just as he wants recreation. Would you go to work if you didn't need the money? Many would respond in the negative, you certainly would not go to work if you did not need the money. But if you think about it further, you may realize that money is not the only thing you get out of working. You also get social interaction, personal satisfaction, ego satisfaction, as well as recognition, social and professional, for the job you do. To some, work is a means of getting away from the house, the wife (or husband), the kids, yardwork, and so on. Certainly, it seems like everyone's dream to be financially independent and not have to work, but it soon becomes a boring existance.

The manager who recognizes Theory Y's implications will soon learn to use that knowledge to his advantage. Unfortunately, many managers today are not well suited for their positions. Quite often the manager of a university D.P. installation is an analyst who worked his way up, or outlived his competition, to get to his position. If not experienced or schooled in personnel management, many of these managers are concerned with systems applications and programs more than the happiness of their staff. It is only when one of their best analyst/programmers resigns that he questions, "What could I have done?", or just chalks it up as "uncontrollable."

Most real managers, those who have a human resources management outlook, will realize problems in morale, working conditions, job assignments, salaries, and so on before they reach the critical stage. They will arrange for motivational adjustments to schedules, assignments, and conditions so that their employees can feel like humans rather than machines, like people rather than prisoners. They must be made to feel like part of the whole.

Motivation

While all managers today fall somewhere between Theory X and Theory Y, there are still too many closer to the former. In a D.P. environment it is mandatory to draw closer to Theory Y, to hold out the carrot rather than to prod with the stick. This will become even more important in the 1980's when price competition for our D.P. personnel will increase. We in the universities, with our limited budgets, must turn to alternative motivational means to help retain our professional employees.

Exactly how we should achive this feat can be based on the findings of Frederick Herzberg. Herzberg's motivational research lead him to catagorize the basic elements of motivation into two groups: hygiene and motivators. Hygiene, or "dissatisfiers" as he also called them, are occupational elements to be maintained at some positive level in order to meet the basic needs of the individual. He identified eleven hygiene factors: salary, potential for growth, interpersonal relationships with superiors, peers, and subordinates, technical supervision, status, company policy, working conditions, noninterference in personal life, and security in the job (Exhibit 5). Once these factors are supported at some positive level, once he has quenched his thirst, he turns to other needs. The absence of any of these elements makes a person dissatisfied with his job, but their presence cannot motivate him.

Herzberg's motivators, called "satisfiers", come into play once the hygiene factors are present. These include achievement, recognition, the work itself, responsibility, and advancement (Exhibit 6). These motivators are effective in boosting the morale and attitude of employees only if the hygiene elements are at a positive level. However, some leeway is given in the determination of the optimum level of hygiene factors, in particular, salary. For example, we know that people will work for less money than they would like if the working conditions are excellent, if the job has security, and so on. It seems, then, that the eleven hygiene factors combined and weighted may be more important than any one of them separately.

Using this knowledge, we of the short budgets can make adjustments to the other ten factors, and do what we can with salary. If we optimize our resources and use our management skills to satisfy these hygiene elements, we can then turn to the motivators to further improve performance and morale. Achievement is at the top of the list of motivators, closely followed by recognition, for what is achievement if it is not recognized? The work itself must be interesting and fulfilling. This is not to say that programmer/analysts do nothing but design new projects, but they should get a mix of tasks. They should be involved with analysis and design, programming, management of projects, user interfaces, and even experimentation of new techniques. They should be given responsibility for whole projects whenever possible to give them a system they can call their own.

Responsibility has been shown to be an important motivator. Many employees have a feeling of achievement and advancement as well as recognition of their capability when given responsibility. Since responsibility is more organization-oriented, it is easier for managers to control than the other four motivators.

Herzberg has put into words what all good managers feel. Employees have certain basic needs which must be met at a certain level. Above this level any increment is of questionable value. For instance, if a programmer was making a good salary but was still unhappy, would a raise make him happier? He probably would be happy for a while, then conclude that he was actually worth it all the time anyway. At that point the effect of the increase is lost to the manager. Rather than automatically increasing the programmer's salary, which is the first thing that comes to the mind of many supervisors, other hygiene factors should be considered and altered if possible.

Once the hygiene factors are satisied, emphasis should be placed on the motivators. Motivation should be a constant thought, not an exception-basis reaction to some personnel problem. We need to make motivation a normal management function in order to fulfill our employee's higher needs.

A comparison can be made between Herzberg's factors of motivation and Maslow's hierarchy of needs (Exhibit 7). Maslow's basic needs, physiological, safety, and social, are shown to completely encompass the hygiene factors determined by Herzberg to be necessarily at a positive level for job satisfaction. Again, these needs and factors pertain to the work environment.

Herzberg's motivators, or satisfiers, are contained within Maslow's self-actualization and esteem needs. They are concerned with the work itself rather than the environment.

Notice that I have included salary within both ranges. This is because salary can and does have an influence on all levels of needs and all factors of motivation to some extent. Increased salary can mean a feeling of recognition, for often, it is the only recognition given. It can mean a feeling of status, self-esteem, security, and advancement. This contributes to the false belief of many supervisors that money is the only answer to all employees' problems.

Conclusion

An employee's needs are the determining criteria for the type of work that employee does. In the 1980's we can expect a still higher need level because of the lack of safety and physiological concerns in the D.P. environment. Managers can increase job satisfaction by addressing their higher needs.

Of course, no employee will remain with an organization which refuses to recognize his true worth, or else consistently harps upon the virtues of the company, the job, and the community while underpaying him. Since salary can mean a feeling of achievement, esteem, and social status as well as being a dissatisfier, it must be kept at a positive level along with the rest of the hygiene factors! It is imperative that all hygiene elements be at a positive level else the employee will feel pressure to change jobs. A manager should use his skills to balance the need factors and achieve an acceptable, averaged level. Only then can he turn to the motivators to further reinforce his employees' positive attitudes toward their jobs.

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EXHIBIT 1

MASLOW'S HIERARCHY OF NEEDS

PHYSIOLOGICAL NEEDS

SAFETY NEEDS

SOCIAL NEEDS

ESTEEM NEEDS

SELF-ACTUALIZATION

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EXHIBIT 2

GOOD WORKING CONDITIONS

RECOGNITION

LOYALTY OF SUPERVISORS

INTERESTING WORK

GOOD WAGES

PROMOTION AND GROWTH AT USL

FEELING AS PART OF THE GROUP

TACTFUL DISCIPLINING

JOB SECURITY

SYMPATHY FOR PERSONAL PROBLEMS

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EXHIBIT 3

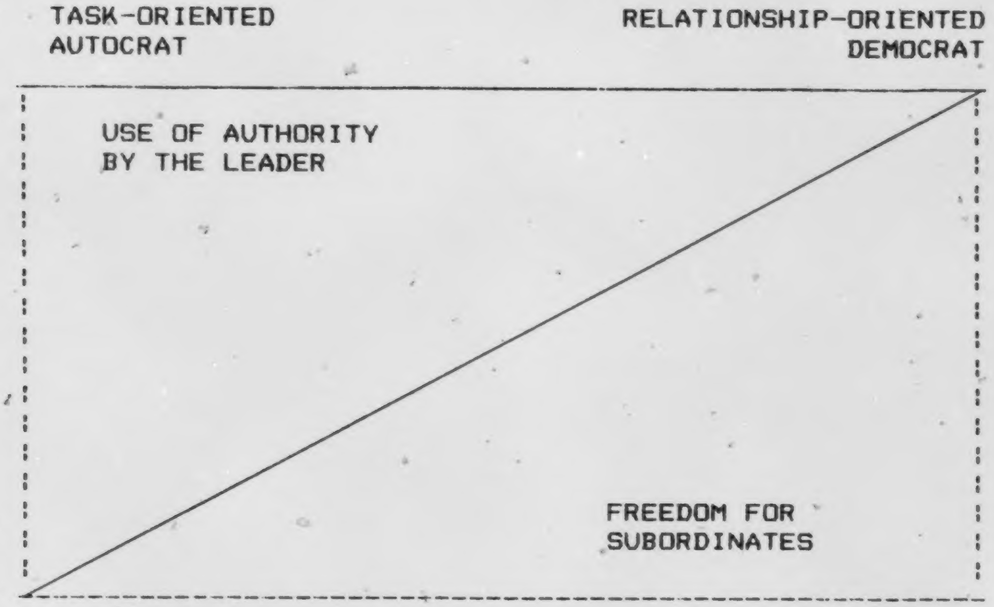
TASK-ORIENTED
AUTOCRAT
RELATIONSHIP-ORIENTED
DEMOCRAT
USE OF AUTHORITY
BY THE LEADER
FREEDOM FOR
SUBORDINATES

EXHIBIT 4

THEORY X	THEORY Y
PEOPLE HATE TO WORK	WORK IS NATURAL
PEOPLE DESIRE DIRECTION AND SUPERVISION	SELF-CONTROL IS DESIRED AND NECESSARY
MOST PEOPLE HAVE NO CAPACITY FOR SOLVING ORGANIZATIONAL PROBLEMS	CREATIVITY IN PROBLEM-SOLVING IS WIDELY DISTRIBUTED
PHYSIOLOGICAL AND SAFETY NEEDS ARE ONLY MEANS TO MOTIVATE	MOTIVATION OCCURS AT ALL NEED LEVELS
PEOPLE MUST BE CLOSELY DIRECTED AND CONTROLLED	MOTIVATION CAN CAUSE SELF-DIRECTION AND CREATIVITY

EXHIBIT 5

HERZBERG'S HYGIENE FACTORS

SALARY

POTENTIAL FOR GROWTH

INTERPERSONAL RELATIONSHIPS WITH SUPERIORS

INTERPERSONAL RELATIONSHIPS WITH PEERS

INTERPERSONAL RELATIONSHIPS WITH SUBORDINATES

TECHNICAL SUPERVISION

STATUS

COMPANY POLICY

WORKING CONDITIONS

NONINTERFERENCE IN PERSONAL LIFE

SECURITY IN THE JOB

EXHIBIT 6

HERZBERG'S MOTIVATORS

ACHIEVEMENT

RECOGNITION

THE WORK ITSELF

RESPONSIBILITY

ADVANCEMENT

EXHIBIT 7

HERZBERG	MASLOW
ACHIEVEMENT RECOGNITION WORK ITSELF RESPONSIBILITY ADVANCEMENT SALARY	ESTEEM SELF-ACTUALIZATION
GROWTH POTENTIAL INTERPERSONAL RELATIONSHIPS STATUS TECHNICAL SUPERVISION WORKING CONDITIONS PERSONAL LIFE JOB SECURITY	PHYSIOLOGICAL SAFETY SOCIAL

THE PCM CONNECTION

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and

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The rather recent success of several plug compatible main frames (PCM) in the market place demands some consideration in analyzing future equipment needs. Some of this equipment offers substantial improvements in price/performance and, by coincidence or otherwise, IBM has also announced a most significant contribution to the price/performance curve. The process used to consider and comparison shop for a PCM as an addition to or replacement for IBM equipment is recounted. The viability of several PCM alternatives, as well as the likelihood of continued support throughout the probable sale and resale of various PCM companies, is also considered. You will share the many potential benefits as well as pitfalls unearthed during the course of our analysis.

THE PCM CONNECTION

Texas Tech University (TTU) currently enrolls approximately 23,000 students and has grown to be one of the four major multi-purpose state universities in Texas. Texas Tech University Health Sciences Center (TTUHSC), created in 1969, continues to grow and to address the unique problems of health-care delivery in rural West Texas. TTUHSC also has regional academic health centers in Amarillo, El Paso, Odessa and Lubbock.

At the time the process of increasing the computing resources available to the University and the Health Sciences Center began, the primary computing resource was a medium-scale IBM 370/145. It served a broad spectrum of computing needs including instruction, research and administration for the University and Health Sciences Center. The central computer center operated on a 24-hour per day, seven days per week basis and provided batch and limited interactive computing, as well as serving as a host for various remote batch stations. The 370/145 was installed in the central facility in 1973 and was upgraded in late 1974 with communications equipment to allow remote access, additional disc storage and memory. Between 1974 and late 1978, the system was not materially upgraded. Overall usage continued to increase with a resulting decrease in computer responsiveness. The development of new administrative applications, as well as further use of the computer in instruction was excessively delayed because of the overloaded condition. In November 1978 a rather belated decision was made to place top-priority on substantially upgrading the computer resources available before the beginning of classes in September of 1979.

The goal was very simple: to do whatever was necessary to accomplish a sizable upgrade in our computer center in such a way as to have it completed and on the air within nine months.

Much has been written over the years about top management's responsibility to knowledgeably plan and control the role of data processing in an organization. Much of what has been written has been for the most part critical of the frequent failure of top management to get sufficiently involved in and behind the computer technology and its role in the organization. The popularity of the minicomputer and the advent of the microprocessor have substantially broadened the base of management personnel who regularly deal directly with data processing. As the data-processing activity has matured in many organizations, the acquisition of additional hardware had become much easier.

- Prices have come down
- As the investment in software and hardware has grown, we have necessarily become more attached to our current vendor (ususlly IBM)
- The potential cost of conversion escalates and the software base grows

Just as management began grudgingly to warm to the task of assuming more responsibility for data-processing's role in an organization, technology dealt us another migraine blow in the area of hardware acquisition. Now, companies such as Itel, Amdahl, Magnuson, and others have come along and developed plug-compatible hardware, some of the operational characteristics of which are superior to the IBM equipment with which it competes. Suddenly, life has become more complicated. Due to their small investment in software, these PCM (plug-compatible mainframe) companies offer significant savings to the IBM user. However, there are potential pitfalls--thus the PCM connection.

This presentation will address the process selected by Texas Tech University and Texas Tech University Health Sciences Center to purchase a system to replace the IBM 370/145. During the process, a potential savings of up to $500,000 was carefully weighed against such considerations as:

- Hardware/software compatibility
- Maintenance record
- User satisfaction
- Bid performance
- Price performance
- Commitment to data processing in the future
- Operating environment, etc.

The first barrier to be overcome at the outset of the process was a fear of the unknown. In our case the unknown fell into two categories:

1. The alledged PCM vendors were generally unknown to most of the staff, and
2. The rate of change in computer technology was such that concern for the next unknown change caused an excess of caution.

The first unknown, that relating to the absence of experience with the PCM vendors, was approached in a relatively clinical way and resolved to almost everyone's satisfaction. We shall discuss this later.

However, the second unknown, that dealing with the rapidly changing state of technology, was somewhat harder to overcome. Many an organization has lulled itself into serious trouble with over-saturated equipment and over-worked staff as a result of "waiting a little longer to see what the next change in technology will bring." Since IBM has a perpetual "new technology waiting in the wings" it is quite possible, operating under this philosophy, to never make a decision. I consider this process akin to waiting until the day before you die to buy your insurance. If you don't have inside information on the subject, you're playing roulette.

1978 serves as the base year when significant numbers of PCM systems entered the marketplace. The number of vendors increased, and user acceptance of the PCM concept became almost universal. Two PCM vendors, Amdahl and Itel, were becoming highly successful with an impressive base of users.

In summer of 1978 Texas Tech University published a plan outlining its projected five-year computing goals as required by the State of Texas. This plan called for an up to seven-fold increase in computing capacity, primarily in the area of academic support. The original plan proposed, as an interim solution, the acquisition of an IBM 370/158 computer, tentatively scheduled for release by another state agency. The objective was to have installed additional capacity before the 1979 fall semester. The opportunity to secure the 370/156 was lost when the University failed to secure a commitment of a firm release date from the other state agency. This failure resulted exclusively from the fact that using the state's own bid process, the other state agency was changing vendors and converting literally thousands of programs. Further comment on the nature of the problem should be unnecessary.

The central State agencies in Austin, Texas have not historically played a significant role in the day-to-day operations of Texas universities. However, as with most state governments, computers are special. As with any major governmental acquisition, securing approval for a computer is a complicated process in the State of Texas. A five year data processing plan must be written which details the phasing of resource needs with acquisitions to meet those needs. Numerous users and administrators worked on several committees in documenting this five-year plan at Texas Tech. This document was forwarded to the Systems Division of the State Auditor's office for review. The University received no official comment on the document for some months, except for verbal requests for additional information. On the theory that silence gives consent, this turned out to be a blessing in disguise.

In January of 1979 the University prepared a document which listed three options available. Option summary may be found in Appendix A.

Option 1. Replace the existing CPU with a four megabyte-6 channel computer with additional peripherals, facilities and maintenance at a projected cost of $3,142,000. This single plug-compatible CPU would need to be large enough to support projected academic/research workloads over a period of approximately five years, and also support existing and planned administrative systems without the need for major system program conversion. The system needed to be capable of field expansion which could be expected to occur from time-to-time during the next five-year period. The details on Option 1 may be found in Appendix B.

Option 2. Move administrative systems to the IBM 370/145 with additional memory and peripherals and add a 370/158 to support academic/research computing with additional peripherals, facilities costs, personnel and maintenance at an estimated cost of $4,712,000. The details on Option 2 may be found in Appendix C.

Option 3. Retain the IBM 370/145 to support administrative applications and initiate conversion to a large-scale system to support academic/research computing with additional peripherals, facilities expenses for two and one-half years and additional personnel and maintenance at an estimated cost of $4,221,305. The details on Option 3 may be found in Appendix D.

Faced with costs ranging from $3,142,000 to $4,712,000, the University administration elected Option 1 and issued a justification of computer acquisition to the Systems Division of the State Auditor's office. Texas Tech University elected to secure the equipment in accordance with Section 6, Article 664-3, V.C.S. State Purchasing Act of 1957 which allows certain state agencies to buy what they feel they need if they are in substantial disagreement with the State Systems and Purchasing divisions.

The State Auditor's office reported that "the University obviously intends to override established State purchasing procedures by restricting bids to specific vendor products. This will, in our opinion, result in still another opportunity lost by failure to evaluate the potential economies available from a fully-competitive bid. We believe that a fully-competitive procurement, properly executed with appropriate criteria for evaluation of cost and performance, is more likely to result in the least cost to the State. We do not believe that $2,000,000 should be committed without this attempt at economy." Copies of this letter of protest were forwarded to the Legislative Budget Board and the Governor's office.

Since nearly two and one-half years had been spent working with the State divisions of Systems and Purchasing to acquire a $140,000 Minicomputer at Texas Tech, we determined that it was quite possible for the University to come to a screeching halt during the multi-year period these agencies would have taken to execute their version of economy.

The bid document was released by the State Board of Control in March of 1979 and the system was awarded to the successful vendor in mid May, installed and running in July.

The decision to bid an IBM 3032, an Amdahl 370/V5, or an Itel AS/6 was the major hurdle in the acquisition process. The question that plagued us the longest was "how plug-compatible is plug-compatible?"

Members of the technical committee reviewed the performance of each vendor's equipment with regards to hardware and software compatibility. Both PCM vendors had large scale systems installed at universities in Texas, and their attitude toward the systems was highly complimentary. Further checks were carefully made with other universities and companies in the private sector, virtually all indicating that the PCM equipment was not only hardware and software compatible, but extremely reliable. Discussions with vendors who had benchmarked the PCM equipment with the comparable IBM equipment led us to conclude that increased throughput was available on comparable PCM hardware in light of the job-mix prevalent in the University environment.

The maintenance record of the equipment and support provided by the PCM vendors was of major concern to Texas Tech University and the Health Sciences Center. Lubbock is located in West Texas, approximately 350 miles from Dallas, El Paso, and Albuquerque. Lubbock is at least one hour by commercial air from any major city. The successful vendor necessarily had to agree to provide manufacturer's maintenance service 24-hours a day, seven days a week. We also wanted to be assured that the PCM equipment was high in technology. We evaluated various vendors through a comparison of their competitive hardware products. We were interested in system software and the level of technical support available from the various PCM vendors. One of our major concerns in the PCM marketplace was the possibility of a vendor suffering an erosion of performance due to the necessity to respond with software to any new microcode improvements made by IBM. We found that one

PCM vendor responded with microcode rather than relying upon software or hardware changes. In general, each of the PCM vendors were making commitments and plans to ensure adequate maintenance support and to upgrade the ability of its product to support future modifications.

We found user satisfaction with PCM equipment to be extremely high. We found the vendors had lived up to all of their commitments and compatibility was early removed as an issue. We found numerous users enjoying secure, substantial increases in capacity at reduced cost.

It would be appropriate now to spend a few moments considering the question of whether to buy or lease. In the current marketplace with the rapid rate of technological change, we had some preference for leasing the replacement computer equipment. However, the nature of the funds available to the University and the fact that the central state agencies were lobbying the legislature to remove the authority of the universities to purchase what they felt they needed, were major factors in our decision to buy the best technology on the market at the best price available. Rather simply stated, a decision to do otherwise would have virtually sabotaged our ability to meet our first and foremost goal: to get a major upgrade in computer capability before the 1979 fall semester.

The bid document released by the University stated a requirement for hardware five-to-seven times as powerful as the existing IBM 370/145, and capable of running all existing programs without conversions. The performance of the bid equipment was documented in numerous trade and technical journals, and we had a broad base of installed equipment with which to draw parallels. We found no difficulty in securing information with which to measure the specified equipment's ability to perform according to our stated standards.

Until you have carefully scrutinized the price-performance ratios involved in plug-compatible equipment operations, it is rather difficult to comprehend what the marketplace currently offers in comparison to almost any other commodity available in our economy. Prices on CPU's, memory, peripherals and other components continue to drop regularly. If you haven't taken a look at price performance availability in the marketplace during the past year, it would be well worth your time.

The future commitment to data processing by the PCM vendors was the most difficult factor to evaluate. IBM has regularly enhanced software and hardware offerings. Will the PCM vendors be successful in staying compatible? Texas Tech University joined a growing number of users believing the PCM's will rise to the challenge. Our 360 and 370 environment is the defacto standard of data processing architecture. We have not left that defacto standard, only improved our price performance ratio through hardware acquisition. With our investment in software protected we are able to evaluate further IBM offerings and their potential to serve our operating needs.

There were other important considerations, such as cost to operate the equipment, environmental considerations, and the vendors relationships with their manufacturers. These were considered and addressed on a point-to-point basis.

There will always be customers who are willing to pay the premium price for the IBM name and support. It is important to note that the support provided by IBM can be substantial. From our personal experience I consider there to be a limited number of organizations who are sufficiently large and mature, or who have sufficient internal systems programming expertise to purchase PCM equipment. However, many colleges and universities enjoy the benefit of significant personnel expertise and experience resident on their staffs. This environment makes available the opportunity to explore and take some risks in meeting computing needs. We spent a great deal of time considering a yield of approximately $500,000 against the several risks involved.

Of much greater significance than the decision made by Texas Tech University is the overall effect the PCM vendors have had on the computing marketplace. Until the successful advent of the PCM vendors, it would have been unreasonable to expect IBM to make the significant price/performance improvements it has recently announced. The PCM vendors have clearly stimulated some of the best characteristics of our private enterprise and free-market system.

At the outset I stated that our goal was to significantly upgrade our 370/145 system without suffering the burden of any conversion, with a delivery time within 60 days of order and with the best combination of price/performance available in the marketplace. Simply stated, we accomplished each of these objectives. The only surprise we have experienced is that the equipment's performance appears to be stronger than we had originally estimated.

APPENDIX A

SUMMARY OF TOTAL ESTIMATED INCREMENTAL COSTS

Option #1

Replacement CPU with 4MB - 6 channels plus additional peripherals, facilities, and maintenance	
Total Estimated Incremental Costs	$ 3,142,000

Option #2

IBM 370/145 to support AIS plus added memory, peripherals, and maintenance - 5 years	$ 507,000
Add:	
IBM 370/158 to support Academic/Research computing plus additional peripherals, facilities cost, additional personnel and maintenance over 5 years	3,500,012
Total Estimated Incremental Costs	$ 4,007,012

Option #3

IBM 370/145 to support AIS plus added memory and maintenance through conversion of systems over 2½ years	$ 500,000
Add:	
Second large-scale system with peripherals required to support Academic/Research computing plus facilities expenses for 2½ years, additional personnel, and maintenance	3,721,305
Total Estimated Incremental Costs	$ 4,221,305

APPENDIX B

OPTION #1

Purchase a single plug-compatible Central Processor (CPU) large enough to support projected academic/research workloads over a period of 5-7 years in the future (or until FY 1984) and also support existing and planned administrative systems without the need for major system program conversions. The system that is purchased must be capable of expansion requirements which will arise during the next 5-7 years without the need for a complete system replacement during that period. Under this option some additional peripherals will be purchased so that maximum required effectiveness may be realized. Some modifications of physical facilities will also be required to accomodate the expanded system.

Option #1

	Incremental Costs
Basic System	
4MB - 6 channel IBM plug-compatible System (CPU only)	$ 1,800,000
Added Peripherals	
Disk Storage (1.2 MB)	180,000
Disk Controllers (2)	130,000
Tape Drives (4)	52,000
Facilities	
Air conditioning for the existing computer center will be increased for all options shown to provide for adequate cooling and a back-up system	N/C
Motor Generator Sets (2)	50,000
Renovations required for addition of disk and tape drives as well as new CPU (removing of existing walls, construction of new walls, electrical work, etc.)	55,000
Personnel	
At least three (3) new professionals will be added to supply systems programming and TP system support. These three professionals will be needed for any of the three options presented.	N/C
Maintenance (5 years)	
Hardware	875,000
Total Estimated Incremental Costs	$ 3,142,000

APPENDIX C

OPTION #2

Purchase a second computer system to support academic/research computing and functionally segregate all administrative computing (data processing) which will continue to be run on the IBM 370/145. With this option it will be necessary to enhance the IBM 370/145 to support planned administrative systems which will require teleprocessing capabilities. Payroll, personnel, and budgeting systems and student information, student financial aids, and admissions systems are examples of planned systems requiring teleprocessing capabilities. This option will require a second staff to operate and maintain the academic/research computer center. This option will also require that space be located, secured (leased) and renovated as needed prior to delivery of the computer system. Such space must be large enough to house the computer CPU, all required peripherals, tape and disk storage space, supplies, and all equipment needed for logistical and administrative support of a computer center. Office space will be needed for a minimum of 17 administrative, professional, and clerical support personnel and space must be renovated to handle the special environmental requirements of a computer center including air conditioning and humidity requirements, security, back-up power supply, raised flooring, and special fire detection equipment. (It has been estimated that at least 6,000 square feet will be needed.)

Option #2 assumes that the second computer system to support academic/research computing will be a used IBM 370/158. All cost associated with the CPU and peripherals are estimated cost of used hardware.

Maintenance cost and estimated cost of personnel training are included.

SECOND SYSTEM TO SUPPORT ACADEMIC/RESEARCH COMPUTING
OPTION #2

1. Personnel necessary to staff a stand-alone computer center that will be located at a site that is remote from the site of the existing IBM 370/145.

Personnel Requirements Position	Salary Rate	
Manager (1)	$ 25,000	
Assistant Manager (1)	23,000	
Secretary (1)	8,700	
Librarian (1)	7,500	
System Programmer (1)	20,000	
Documentation Specialist (1)	10,000	
Operations Manager (1)	18,000	
Operators (6)	63,000	
Data Processors (2)	16,000	
Student Assistants (2 FTE)	12,500	
Annual cost of salaries and wages	$203,700	
Projected cost over a five-year period assuming increases of 5.1% annually . . .		$ 1,128,264
Add fringe benefits at 14%.		157,958
Total projected cost for personnel and fringe benefits over a five-year period (FY 79-80 thru FY 83-84).		$ 1,286,222

2. Other expenses for maintenance and operations of a computing center for Academic/Research use - projected over five years.

Maintenance	$410,000		
Travel	25,000		
Training Expenses	45,210		
Equipment Expenses	17,000		
Total other expenses		497,210	
Estimate of total cost for operating and maintaining a separate, stand-alone computer center to support Academic/Research users over a period of five (5) years (FY 80-FY 84)			$ 1,783,432

3. Facilities (Space) Requirement

Administrative	1,200 sq.ft.		
Systems Staff	200		
Applications Staff	1,200		
Machine Room	2,000		
Production/Operations	500		
All Other	900		
Minimum Space Required	6,000 sq.ft.		
Leased space (off campus) at $8.00/sq. ft. per year with 6% increase each year for 5 years			
(6,000 X $8.00) X (1.06 X 5)		$ 270,580	
Renovation cost for environmental requirements such as air conditioning (dual systems), humidity control, security, raised floor, fire detection, back-up power, etc.		225,000	
Total facilities (space) requirement - 5 years			495,580

4. Estimated Total Cost (5 years) $ 2,279,012

APPENDIX D

SECOND SYSTEM TO SUPPORT ACADEMIC/RESEARCH COMPUTING
OPTION #3

1. Personnel necessary to staff a stand-alone computer center that will be located at a site that is remote from the site of the existing IBM 370/145.

Personnel Requirements Position	Salary Rate
Manager (1)	$ 25,000
Assistant Manager (1)	23,000
Secretary (1)	8,700
Librarian (1)	7,500
System Programmer (3)	60,000
Documentation Specialist (1)	10,000
Operations Manager (1)	18,000
Operators (6)	63,000
Data Processors (2)	16,000
Student Assistants (2 FTE)	12,500
Annual cost of salaries and wages	$243,700

Projected cost over a five-year period assuming increases of 5.1% annually	$ 1,349,289	
Add fringe benefits at 14%.	188,901	
Total projected cost for personnel and fringe venefits over a five-year period (FY 79-80 thru FY 83-84)	$ 1,538,190	

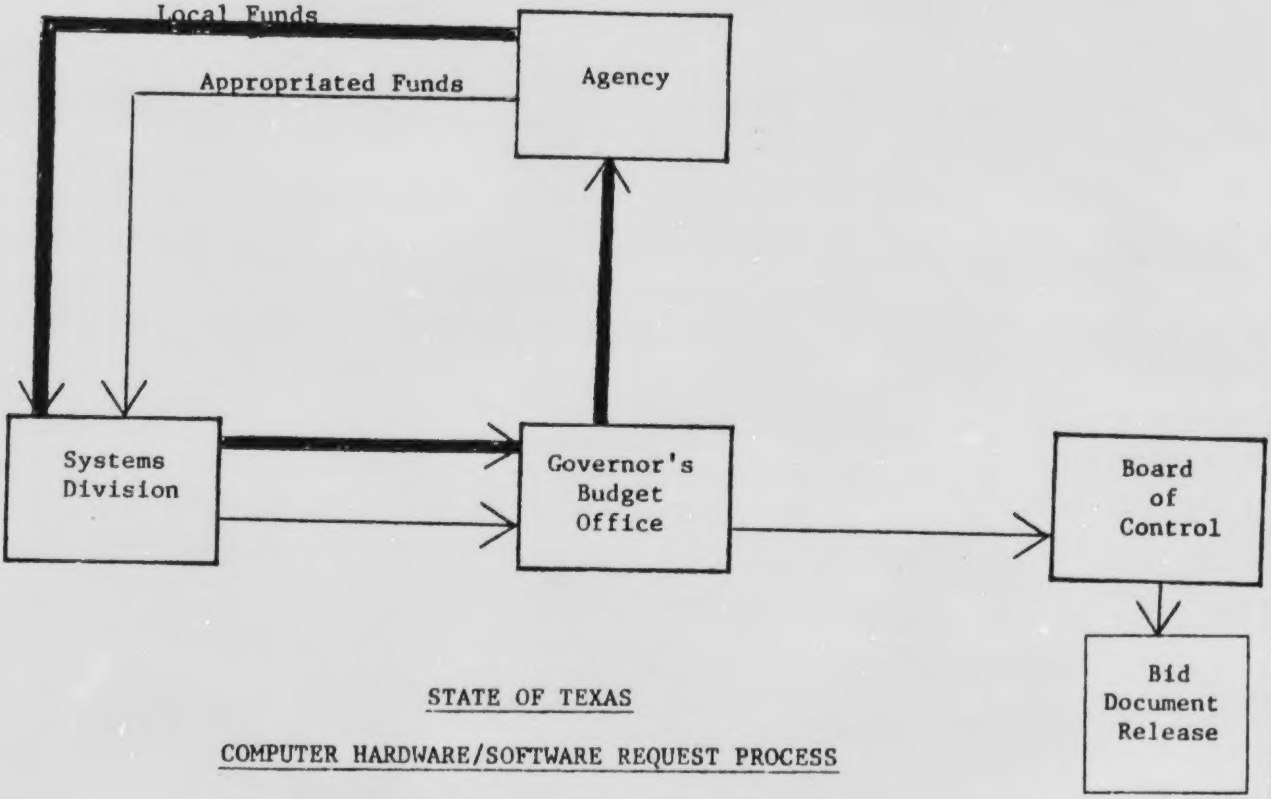
2. Other expenses for maintenance and operations of a computing center for Academic/Research use - projected over five years.

Maintenance	$410,000		
Travel	25,000		
Training Expenses	45,210		
Equipment Expenses	17,000		
Total other expenses.		497,210	
Estimate of total cost for operating and maintaining a separate, stand-alone computer center to support Academic/Research users over a period of five (5) years (FY 80-FY 84)			2,035,400

3. Facilities (Space) Requirement

Administrative	1,200 sq.ft.		
Systems Staff	200		
Applications Staff	1,200		
Machine Room	2,000		
Production/Operations	500		
All Other	900		
Minimum Space Required	6,000 sq.ft.		
Leased space (off campus) at $8.00/sq.ft. per year with 6% increase each year for 5 years (6,000 X $8.00) X (1.06 X 5).		$ 270,580	
Renovation cost for environmental requirements such as air conditioning (dual systems), humidity control, security, raised floor, fire detection, back-up power, etc.		225,000	
Total facilities (space) requirement - 5 years			495,580

4. Estimated Total Cost (5 years) $ 2,530,980


Local Funds
Appropriated Funds
Agency
Systems Division
Governor's Budget Office
Board of Control
Bid Document Release

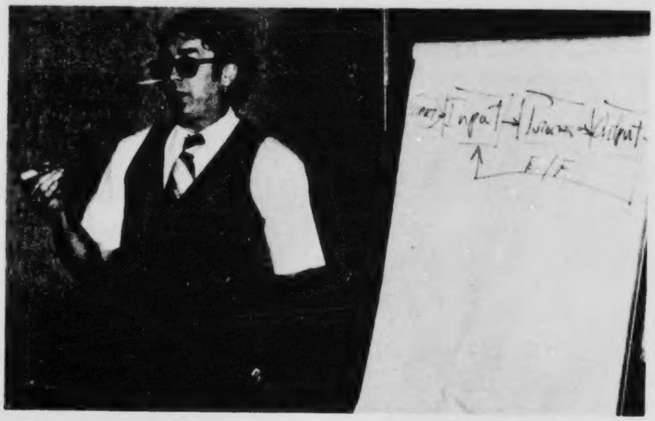
STATE OF TEXAS

COMPUTER HARDWARE/SOFTWARE REQUEST PROCESS

TRACK II
DEVELOPMENT OF INFORMATION SYSTEMS

Coordinator:
Maureen Murphy
University of Oklahoma

Sandy T. Dennhardt
University of Illinois



William A. Rodgers
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OFFICE OF THE FUTURE - TODAY

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Abstract

Many functions of the office of the future are available today. Documents are created, transmitted, stored and retrieved electronically. Secretaries are aided by computers in the preparation and distribution of correspondence, telephone answering, and scheduling of conferences. This paper will describe the system in use today at Amoco Research Center in Tulsa, Oklahoma.

The 650 scientists and support personnel at Amoco's Tulsa Research Center provide research, development, and technical service in petroleum exploration, production, computer science and related fields for Amoco Production, Amoco International Oil Company and the parent Standard Oil Company (Indiana).

The "office of the future" at Amoco Research was not planned, cost justified and implemented, but evolved from the necessity of coping with increasing paperwork.

In 1972 a word Processing Center was established using IBM magnetic tape typewriters and a Dictaphone central dictating system. This center was an overwhelming success, but had more typing than could be handled. Knowing that the 1403 line printer was 100 times faster than the magnetic typewriter, the Center appealed to Computing Research for help.

A Communicating Magnetic Card typewriter was obtained and word processing personnel began using the Script program for text formatting. Soon a CRT was installed and all the documents that could be printed on the line printer were created using VM/CMS on the 370/168 computer. The majority of documents was excluded because of the Greek and math symbols used in scientific work.

With the advent of the IBM Inkjet printers and software developed by Computing Research most documents created on the CRT's could be printed. IBM Magnetic II typewriters are still used for some equations.

Meanwhile, those duties that had been left in the traditional secretarial areas - the administrative duties - were suffering because each Administrative Secretary was serving a large number of principals.

A Central Answering Service was installed. When a principal's phone rings three times it is switched to the Central Answering Service. By typing his extension number on the CRT, operators have access to his lunch hour, name of his administrative secretary and other persons to whom his calls could be referred. The operator can type in a message from the caller. A "hotel-light" on the principals telephone notifies him that a message is waiting. This system allows two operators to back up 120 telephones.

Distributing all the documents produced by word processing became a problem for the administrative secretaries. In April 1977 the Administrative Project Center was established using the computer to maintain address lists and generate labels which could be printed on the line printer or on word processing equipment. Copying-collating, assembly and distribution of many routine documents are handled by the Administrative Project Center. Another function of the center is to train replacement administrative secretaries and provide vacation relief.

With so many documents being created and distributed by the computer, the next logical step was an electronic office system. We use this term to include creation, distribution, filing, retrieval and control of documents.

Personal management functions available in the system are: calendar, conference room schedule, telephone directory, and list of the Electronic Office System (EOS) users.

Informal communications are handled by a "note facility". Copies of the note are kept as long as needed by the sender and recipients. Notes can be forwarded to another person with comments.

Formal communications are created by dictation or hard copy through the Word Processing Center. To create a document the secretary initiates an interactive program by typing the word "memo". She then responds to questions for format, author, file, addressee, subject, text of memo, her initials, attachments, and copy list. The computer alphabetizes the list of addressees and copy list. At this point she has a number of options. By typing "d" she can view a draft of the document on her CRT.

The document may be viewed by the principal or his administrative secretary on a CRT. They can make minor corrections and the Administrative Secretary mails the document electronically. If necessary a hard copy can be requested from the line printer, Inkjet or other hardcopy terminals.

Incoming electronic mail is automatically logged in on the recipient's virtual machine. Incoming hard copy can also be added to this mail log which can be searched by author, subject, key word, addressee and time.

Large documents are kept on line and selected portions can be accessed via CRT. Company procedures and computing standards will be available in this large online document system.

In 1972 before Word Processing, 36 secretaries supported 225 professionals. By the end of 1978 13 word processing and 21 administrative secretaries were supporting 310 professionals. Typing output has increased from 7,200 to 11,400 lines per day.

Managerial and professional personnel estimate they are saving 7% of their time by using the electronic office system and administrative personnel estimate a 20% time saving.

We have only "scratched the surface" in applying electronic technology to the ever-increasing paperwork problems, but are convinced that we have taken the necessary first steps to developing a useful information system.

A DISTRIBUTED PROCESSING APPROACH TO WORD PROCESSING/DATA PROCESSING

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ABSTRACT

The advent of electronic word processing has been rapid and pervasive. A variety of approaches have been employed ranging from centralized word processing pools utilizing data processing's computer to stand alone word processing systems. This paper describes the Distributed Word Processing System developed at the University of Kansas, which incorporates an IBM 3031, ATMS (Advanced Text Management System) as its primary software, and various CRT's and printers for entry and printing.

The cost benefit analysis of the distributed system versus standard typewriter, mag-card, and other advanced word processing systems will be developed. This analysis will show that (under standard assumptions) the cost per page will range from 67¢-73¢ for the Distributed Word Processing System (see text) to

approximately 94¢ for the more esoteric stand alone word processing system. The costs include all personnel, equipment, and prorated computer and software costs.

The intangible benefits from electronic word processing will be considered. These benefits may overshadow the direct cost savings as a primary reason for the shift to electronic word processing.

Utilization of the Distributed Word Processing System to produce course catalogs, annual reports, hardware/software proposals, business procedures manuals, and other administrative documents will be discussed.

THE SETTING

Established in 1865, the University of Kansas is comprised of 85 major buildings on its 1,000-acre main campus in Lawrence, 55 buildings of the College of Health Sciences and University Hospital on 50 acres in Kansas City, a branch of the School of Medicine in Wichita, and numerous educational and research facilities throughout the state.

More than 26,000 men and women attend the 14 major academic divisions that constitute the University, pursuing degrees offered in 112 baccalaureate, 100 master's, and 54 doctoral programs. Some 9,000 faculty and staff administer to the resident student body and the thousands who each year enroll in off-campus credit and non-credit courses.

The state's largest university and one of its largest employers, the University's annual operating budget exceeds $200 million. Additionally, physical plant replacement costs for the Lawrence campus is in excess of $300 million; for the Medical Center in Kansas City, it has been placed at $170 million.

The University has three computing centers. One is located at the Medical Center and is utilized by administrative, instruction, and research users; the other two are on the Lawrence campus.

On the Lawrence campus, one center is dedicated to instruction and research computing, and the other center (Office of Information Systems) supports administrative computing.

Administrative computing at the University of Kansas, Lawrence campus, as with many other colleges and universities, goes back to the 1950's with tabulating equipment. The University's first administrative computer, an IBM 1401, was installed in 1960.

In addition to the IBM 1401, some administrative computing was run on the academic computer, an IBM 7090. Computing progressed through the IBM 370 systems to the present IBM 370/3031, installed on July 28, 1979. This is a large scale IBM system consisting of 3 megabytes of memory, 3.5 billion bytes of disk storage, five tape units, two printers, card reader, card punch, remote communications processor, and three local communication controllers. The teleprocessing network for the Lawrence campus includes over 100 terminals, located in 20 different administrative offices.

Organized in July, 1976, the Office of Information Systems provides information systems services to the Lawrence campus and the University. These services, furnished by a staff of 64, center around the IBM 3031 processor and include systems design and analysis, programming, data entry, data preparation, and computer operations.

The department is housed in a modern, two-story computer services facility designed specifically to optimize the structural and environmental characteristics of data processing operations.

The building, with 41,500 net square feet of floor space shared equally by the Information Systems staff and the Academic Computer Center, was completed in July, 1978.

INTRODUCTION

The advent of electronic word processing has been rapid and pervasive in all aspects of business and university life in recent years. There are a variety of systems available, and new systems are being offered on the market daily. The purpose of this paper is to make some comparisons of the basic systems. These systems are: typist with typewriter, typist with mag-card or memory typewriter, stand alone advanced equipment such as a Xerox 800 system or IBM Office System 6, and finally a Distributed Word Processing System operating on a large main frame. The University of Kansas utilizes all of the above systems, and the various merits of these systems, as we see them, will be indicated.

Although a cost benefit analysis is important in the analysis of the word processing system, there are other benefits

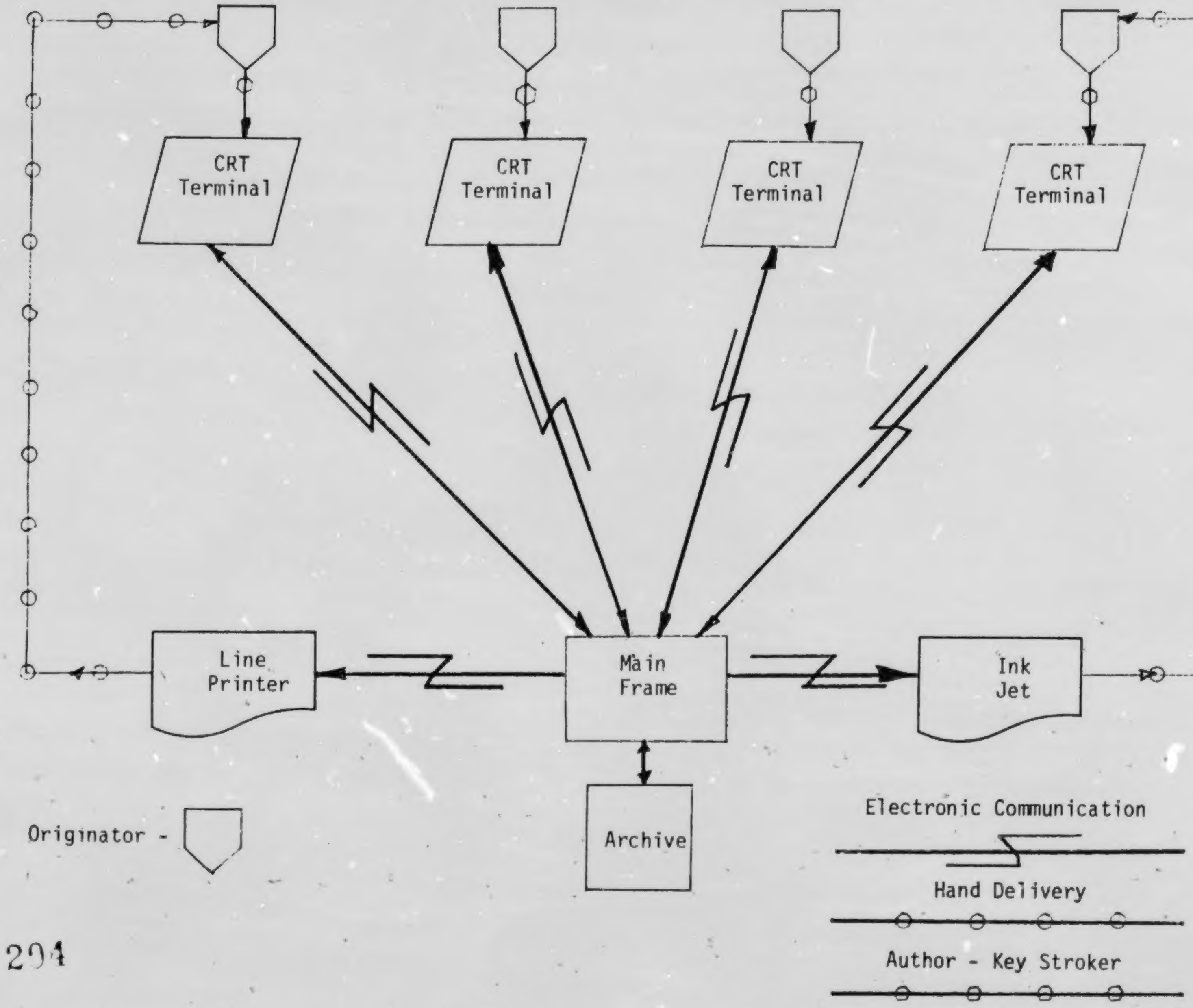

CRT Terminal
CRT Terminal
CRT Terminal
CRT Terminal
Line Printer
Main Frame
Ink Jet
Archive
Originator -
Electronic Communication
Hand Delivery
Author - Key Stroker

FIGURE I.

(or detriments) which must also be considered. Probably the primary advantage of electronic word processing, outside of a general decreased cost per page for revision, is the increase in job satisfaction for clerical help. An increase in job satisfaction will result in decreased turnover and a concomitant reduction in overall cost of paperwork processing for any organization.

All of the systems considered in this paper are self-explanatory, with the exception of the Distributed Word Processing System in use at the University of Kansas. Figure 1 is the schematic of the system. As you will note, there is a main frame with a line printer and an IBM Office System 6 ink jet printer for high quality output. Each of the word processors operates a CRT terminal that is hard wired to the main frame .

The selection of line printer or ink jet printer is determined by the originator. All output and deliveries are on a half day basis. The archiving of documents to magnetic tape is done on a daily basis. The rest of the diagram should be clear.

The ink jet printer is located at the word processing center where the supervisor of the system is located. Training and technical consultation also takes place at the center.

THE ENVIRONMENT

The computer software used at the University for Distributed Word Processing is the Advanced Text Management System - II (ATMS-II). This software was developed by IBM and is designed to enable a terminal user to enter, edit, store, format, proofread, and display textual material in an efficient manner. At the University, ATMS-II runs on the administrative computer, utilizing OS/VS1 as its system control program and CICS/VS as the teleprocessing monitor. Because ATMS-II executes as a CICS/VS application program, it is capable of being multi-tasked along with other CICS/VS applications. ATMS-II will also run under DOS/VS. In addition to ATMS-II, the University uses another software product called "ATMS-II Support for IBM 6640 Printer". This utility allows documents to be sent over communication lines to ATMS-II files via the IBM System 6 or to the IBM System 6 from the main system's permanent storage.

Word processing/data processing equipment used to provide word processing services include IBM and Courier terminals with upper/lower case keyboards, IBM 1403/N1 printer with an upper/lower case print train, Xerox 1720 communication terminals, IBM terminal printers, and three IBM System 6/440 Information Processors with ink jet printers. There are three basic equipment configurations located in the user offices. Some word processing users have only one terminal, others have a terminal and a Xerox 1720, and others have a terminal with an IBM System

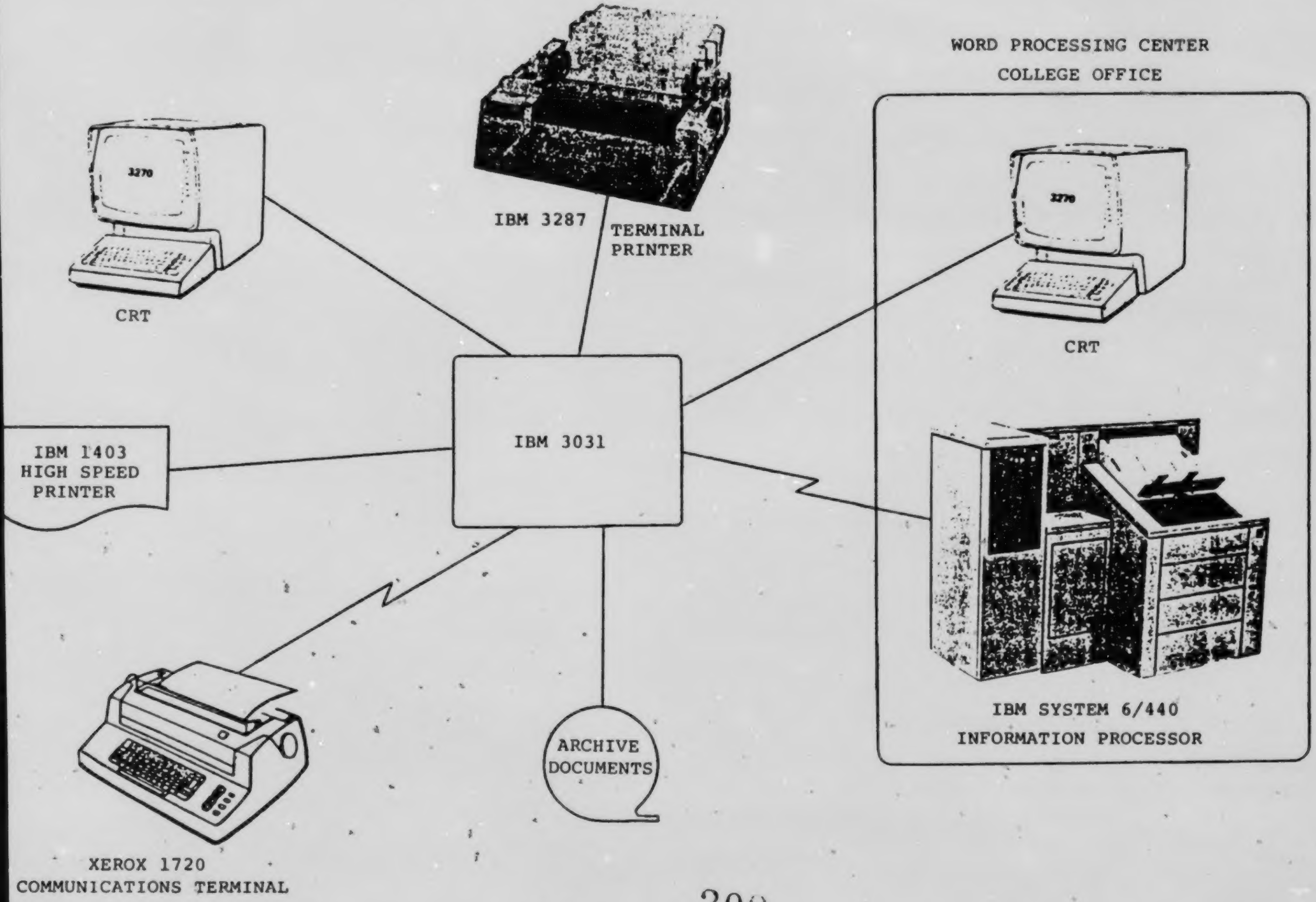
6. These configurations allow a user to utilize university word processing services for as low as $64.00 per month with one terminal to a high of $864.00 per month with a terminal and System 6. All administrative terminals are multi-purpose, so the cost of one word processing terminal is prorated as to the usage for administrative online systems and word processing.

For online entry and editing the IBM 3270 or compatible terminal works very well. The terminal operator can view the information in context, immediately seeing how corrections and modifications to a page will look. The printing of ATMS-II documents is accomplished by any of the four printing devices mentioned above. Most of our users will use the IBM 1403 for high-speed printing of draft documents. The turnaround time for the high-speed printer is twice daily, which provides a very fast and efficient method for draft documents. The Xerox 1720 and System 6 are used for draft and final copy.

The following diagram displays the distributed word processing/data processing network at the University of Kansas.

WORD PROCESSING / DATA PROCESSING NETWORK

UNIVERSITY OF KANSAS


IBM 3287
TERMINAL PRINTER
CRT
3270
WORD PROCESSING CENTER
COLLEGE OFFICE
CRT
3270
IBM 1403
HIGH SPEED
PRINTER
IBM 3031
IBM SYSTEM 6/440
INFORMATION PROCESSOR
ARCHIVE
DOCUMENTS
XEROX 1720
COMMUNICATIONS TERMINAL

COST BENEFITS

Before considering the cost benefit analysis of the various systems some general points with regard to word processing systems is in order. It is the feeling of many administrators, and of the authors of this document in particular, that in order for word processing to be effective the originating terminal and/or word processor must be in reasonably close proximity to the author. This means that the word processor/typist must normally be located in the same unit, or very close to the same unit, as the material originator. In addition, a number of faculty members at the University of Kansas use the terminals themselves, both for initial key stroking and for revision. This is probably unique to universities with limited clerical support. As a result of the previously mentioned reasons --and others-- a primary tenet for word processing at the University of Kansas is to distribute the input mechanism to the various units, i.e. provide most units with a CRT.

Table I enclosed provides some general cost information on various word processing systems. The highest cost --an inescapable cost-- of any system is the initial key stroking of the document. It is assumed that this is done by a typist or word processor. For the basis of this analysis $700 per month is used as the basic personnel cost. This cost may be considered low relative to other parts of the country, but is typical of costs in Lawrence, Kansas. Other costs included in the table are probably uniform throughout the country.

In order to make comparisons between the various systems, cost per month is used as the basis for comparison. Other costs such as mag-card or memory typewriter at $270 per month are typical of the lower order word processing systems. Item 3 relates to stand alone advanced text processing equipment such as the Xerox 800 system and the IBM Office System-6 with ink jet printer. There are a variety of other systems whose costs range from the $270 figure to well above $800, depending on the particular features of the system.

The costs of the first three items are self explanatory. Item 4, Distributed Word Processing, requires some notes.

As noted, the costs are based on a 30 terminal system. At the University of Kansas the number of terminals which are used for word processing is probably closer to 75. Since many of these are also used for other purposes, the number 30 will be used to represent "full time" terminals. The most difficult -- and largest-- cost to determine is the CPU. The cost for CPU usage is based on program counts for the various systems using CICS, through which ATMS operates. We have listed $8,360 as the nominal cost. This is a worst case situation, based on the assumption that all CICS tasks are of equal cost. However, a careful analysis indicates that a majority of ATMS tasks are less

TABLE I

Text Processing Costs

		Cost per Month
1.	Key Stroker (Typist, Word Processor)	$ 700.00
2.	Mag-Card/Memory Typewriter	270.00
3.	Stand Alone Text Processing Equipment	
	a) Xerox 800 System	750.00
	b) IBM Office System 6 with Ink-Jet Printer	800.00
	c) IBM Office System 6 without Printer	275.00
4.	Distributed Word Processing	
	a) Fixed Cost (30 terminal system)	
	CPU	8,360.00
	Disc	309.00
	Software (ATMS)	850.00
	Output (Line Printer per page)	.02
	(OS-6 Ink Jet Printer)	800.00
	b) Variable Cost	
	CRT Terminal	64.00

TABLE II

Text Processing Production Rates

Non-Technical	Original	Revision
1. Typewriter	80 pages/day	80 pages/day
2. Mag-Card	80 pages/day	240 pages/day
3. Advanced Text Processing	80 pages/day	800+ pages/day
4. Distributed Text Processing	80 pages/day	800+ pages/day
Technical		
1. Typewriter	40 pages/day	40 pages/day
2. Mag-Card	60 pages/day	120 pages/day
3. Advanced Text Processing	80 pages/day	800+ pages/day
4. Distributed Word Processing	Not Available	

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TABLE III

Cost Comparison

Method	Cost/Month	Pages/Month	Cost/Page
Non-Technical (30 station)[1]			
1. Typewriter	$21,000	24,000	$.88
2. Mag-Card	29,100	36,000	.81
3. Advanced Text Processing	45,000	48,000	.94
4. Distributed Word Processing	34,811	48,000	.73
Technical (30 station)[1]			
1. Typewriter	$21,000	12,000	$1.75
2. Mag-Card	29,100	24,000	1.21
3. Advanced Text Processing[2]	45,000	48,000	.94
4. Technical Typing Network[2]	37,125	48,000	.77

[1] Based on retyping and revision of every original page once.

[2] Based on 15 OS-6 Ink Jet Printers and
15 OS-6 without Printers

costly than other CICS tasks. Making adjustments for this reduces the figure to a more accurate cost of $6,080 per month. As noted above, $8,360 is used as the worst case situation. The disc is an apportioned cost, while the software cost is the total cost of the ATMS software.

There is some marginal increase in the costs listed as Fixed Cost under 4a with increased thru-put, but this is not a linear increase. The only linear costs are the CRT terminals, and there is a step increase in this cost.

Table I, Item 4a (Output) lists two output devices, a line printer and OS-6 ink jet printer. For rough work --work to be revised-- and internally distributed work the line printer is normally used. For final copy on bond or letterhead paper the System 6 ink jet printer is used. The ink jet printer produces high quality output at about 45 seconds per page. Although one ink jet printer is not sufficient to produce 48,000 pages, the cost of only one is included in this analysis. At the University of Kansas we are able to produce sufficient final output with one ink jet printer. The output (48,000 pages in Table III) is assumed to be: 36,000 pages (line printer) and 12,000 pages (ink jet printer).

It should be noted and emphasized that the full capabilities of the Distributed Word Processing System can be brought to a unit merely by the installation of a CRT terminal. The marginal cost for this is extremely low. This low marginal cost allows us to install terminals in units where the effective use may be as low as 10%, yet still maintain a positive cost benefit. Although this is an important aspect of Distributed Word Processing, its ramifications will not be discussed here.

Table II lists typical production rates for the various text processing systems. Eighty pages per day is listed as the initial key stroking rate. This is probably on the high side in most cases, but in order to insure a reasonable apportioning of cost between machines and personnel, it is probably best to use the higher numbers for the initial key stroking. (It is easy to show that this reduces the cost between typewriter alone and machine processing. Reducing the pages per day of initial key stroking increases the difference in cost.)

We note that for all the word processing systems, the initial or original input rate is 80 pages per day. One must recognize that independent of the technical advances available the initial key stroking is the highest (and inescapable) cost of any word processing system. Additional comments on this point will be made later.

The revision rates are key to any discussion of word processing. As you will note, for the non-technical word processing the revision rate for a typewriter is the same as for the original, 80 pages per day. Advantages for a word processing system are centered on the reduction of this particular number. The revision rate has been estimated at 240 pages per day for a mag-card typewriter. The revision rate for the advanced text processing and distributed text processing systems has been estimated at 800+ pages per day. It has been our experience that when you have full page display on a CRT, the revisions can be done at an extremely rapid rate. It is of particular interest to notice the difference between the mag-card and the CRT display revision rates. This is the primary advantage of the advanced text processing systems.

The production rates listed above are based on non-technical typing, as would be typical of a manuscript for the humanities or social sciences . The second part of the table lists some typical typing rates for technical typing for such departments as biological sciences or chemistry.

The initial key stroking of a technical paper on a typewriter is one half the normal rate. This is based on the fact that two or more type fonts are necessary to produce the technical typing. The mag-card is not quite as slow as the normal typewriter, but once again slower than non-technical typing. Advanced text processing systems offer a great advantage in this area because the technical fonts are available as a standard part of the keyboards. The technical characters and symbols are available by a single or double keystroke, similar to changing from lower to upper case.

Once again you will note that advanced text processing has an extremely high revision rate for technical typing. The full page or partial page display on a CRT makes revisions of technical typing extremely rapid.

At present, technical typing is not available on the distributed word processing system.

Table III makes cost comparisons between the various word processing systems for technical and non-technical typing.

To find a reasonable cost sharing for the fixed cost of the distributed word processing systems, the costs are based on a 30-station system.

For the non-technical typing - Item 1 - Typewriter - the total cost per month is the typist's wages. (The cost of the typewriter is not included.) The pages per month are calculated on a 20-day working period per month. Under the assumption that every page of typing must be retyped at least once, the cost per page of output is 88¢. It should be noted that the cost per page of key stroking is 44¢. Since all word processing systems require the initial key stroking, the minimal cost for any system is 44¢ per page. Therefore, any technical advances in word processing can at best reduce the cost per page asymptotically to 44¢. It is the reduction of costs in the revision process that provides an advantage for the various text processing systems. If the text processing environment is such that no revisions will be necessary, the optimum system would be a standard typewriter in order to keep the equipment cost to a minimum.

As shown in Table III, the various systems have increased costs as the amount of equipment involved increases. The Advanced Text Processing System equipment related costs are the highest, due primarily to the fact that each indivdual word processor must be provided with an identical text processing system.

The Distributed Word Processing System has a total cost of $34,811 for the 30 station unit, approximately $10,000 less than the total cost for the Advanced Text Processing System. By comparing Items 4 and 1, it can be noted that of the $34,811, approximately two-thirds is for the initial key stroking. The production rate increases dramatically with the more elaborate text processing systems. This is due to the fact that the revision rates are very high on the advanced systems.

The costs per page are listed on the right hand side and it can be seen that the first three listed systems have essentially linear costs. If the lower cost of $6,080 for the CPU had been used, the cost per page for Item 4 - Distributed Word Processing System would be 67.5¢. Technical typing is considered in the second half of the table and as will be noted, the costs per month are about the same as those for non-technical, while the production rates vary somewhat for the various text processing systems. It should also be noted that the advanced text processing production rates are the same for technical and non-technical typing becuase of the ease of changing fonts (as noted above).

At present, full technical typing capability is not available on the Distributed Word Processing System. A Technical Typing Network has been included as an alternative. The Technical Typing Network consists of pairing an OS-6 Ink Jet printer with an OS-6 Work Station (i.e. an OS-6 without a printer) and providing hard copy for both from the one ink jet printer. The production rates are about the same for the advanced text processing and for the technical typing network, but the reduction in the equipment costs considerably decreases the cost per page of the latter.

The above comparisons give the reader some idea as to the basis on which one may make a decision for the selection of a word processing system. In most cases, a variety of the systems listed above will be optimum, with the particular mixture depending upon the particular needs involved.

The analysis is based on entering and revising each page of a manuscript once. In most configurations a variety of other tasks are performed, such as individually addressed form letters, and relatively permanent records which are revised on a periodic basis, such as curricular vitaes and/or catalogue copy. As was previously noted, the initial key stroking for any of these documents is approximately 44¢ per page. The revision rate is still 44¢ per page if done on a typewriter. This establishes an upper and lower cost bracket within which one may operate. The primary advantage of any electronic text processing system is in the ability to reduce the revision costs.

Many of the advanced text processing systems have a variety of additional advantages, such as sorting systems and various file systems. These have not been included here since the variety of needs and applications make it difficult to provide a uniform analysis.

The emphasis above is on the costing and some other advantages of the various technical systems, but it would be remiss not to mention again what in the final analysis may be the most important aspect of the introduction of electronic word processing. This is the increase in job satisfaction. This increase in job satisfaction comes from the simplicity of the revision process. Once a document has been entered the time necessary to provide any and all revisions is minimal. The word processor does not find him or herself typing the same document for the second, third or fourth time. A further advantage, and certainly an important aspect of electronic word processing, is that no additional typographical errors are produced in the revision process. Revising a document and finding additional typographical errors induced is indeed frustrating.

Other aspects of the Distributed Word Processing System at the University of Kansas which we have found to be advantageous are the centralization of training and the capability of using minimally trained word processors. An initial training period of approximately 10 hours is provided in our central training site. This is normally done on the basis of an hour to an hour and a half per day, for five to eight days. Although this is not sufficient training to use all the features of the word processing system, it is quite sufficient to key stroke all documents into the system. When the more elaborate revision processes or features are needed, the word processors may call on the technical consultants at the word processing center to provide revision help. As has been noted from Table II, the revision rate is 800+ pages per day. By providing one or two highly trained word processors within the system, all revisions may be done at the central site. We are thus able to provide relatively minimal training for the majority of word processors within the system, yet still provide full use of the most elaborate features of the system. This is only possible because the documents are available both at the initial key stroking site and at the central word processing center. In fact, they are simultaneously available at both sites which allows the inexperienced operator at the key stroking site to consult with the word processor at the central site quite conveniently. We have found this to be a great advantage in the use of personnel.

Other features we hope to introduce into the Word Processing System at the University of Kansas include optical character reading of documents produced on a standard selectric typewriter with an OCR element. This will provide many additional key stroking stations for the Distributed Word Processing Network. We expect to implement this experimentally within the next several months. An experiment has also been initiated attempting to provide materials directly from the Distributed Word Processing System to the composing network at the State Printing Service.

TEXT PROCESSING SYSTEM SUMMARY

1. Typewriter

Advantages: Low equipment cost, no technical training required, can easily be distributed to user site, low failure rate.

Disadvantages: High revision cost, high duplicate letter cost.

Best use: Short letters with no revision required.

2. Mag-card

Advantages: Low equipment cost, relatively easy to distribute to user site. Duplicate letter cost low.

Disadvantages: Difficult line by line revision mechanism, difficult to use as unattended printer.

Best use: Relatively short letters with some revisions.

3. Advanced Text Processing

Advantages: Same as 4.

Disadvantages: High equipment cost. High technical skill operator.

Best use: High revision environment such as documents and repeated reports, catalogue copy, etc. where a central computing site or dedicated mini is not available.

4. Distributed Word Processing

Advantages: Extremely low revision cost. Increased typing speed of initial keystroking because of ease of correction. Repeat letter to multiple addresses with variable inserted information at low cost. Automatic sort and file systems available. High job satisfaction. Modest technical training of operator satisfactory.

Disadvantages: requires large computer site or dedicated mini. One or two highly trained operators required to manage system.

Best use: Large word processing environment with minimum of 20 input sites.

USING WORD PROCESSING TO PRODUCE COURSE CATALOGS

Another valuable capability of the word processing system is that of merging data from other information systems' data bases with text information which has already been stored into the ATMS system. An example of this type of activity is demonstrated by the University Course Catalogs which are produced by the Office of University Relations using the ATMS system. Personnel in the University Relations office prepare text informatiom which becomes part of the course catalogs. At the same time, the Office of Admissions and Records enters descriptive information describing the courses which are offered by the University into a data base which is used by the Student Records Information System. Programs were written that allow the course catalog information, on the Course Catalog data base, to be extracted and formatted for batch input to the Advanced Text Management System (ATMS). This data is then merged with the additional text that was entered by the University Relations Office. Once the merged files are completely edited and ready for production, the data is archived from ATMS to a computer tape and sent to the State Printing Office in Topeka. The Printing Office has a minicomputer (Digital PDP-8) that is programmed to accept an ATMS archive tape and create a camera ready copy of the University catalog. After the camera ready copy is completed by State Printing, it is sent back to the University for editing. Once a clean camera ready copy is completed, it is then sent to the

University's printing department where the course catalogs are produced.

The University produces six catalogs per year using the ATMS system. Catalogs are produced for the areas of Undergraduate, Graduate, Medicine, Independent Study, Law, and Social Welfare. By using the ATMS system, the Office of University Relations has substantially reduced the cost of producing a course catalog. The new method this past year cost $4,767 to produce the camera ready copy for the Undergraduate Catalog, which is two-thirds the cost of producing the catalog under the old method. The average cost for producing the camera ready copy was $14 per page. The University produced 40,000 Undergraduate Catalogs this past year, costing $25,000 for the printing and $4,767 for the camera ready copies.

CHANCELLOR'S INFORMATION SYSTEM

This fall an on-line name and address system has been designed for the Office of the Chancellor. The system will allow on-line entry and updating of names, home and business addresses, telephone numbers, spouse and children names, and education of the addressee and spouse. In addition, interest or affiliation codes can be entered to allow selection for mailings by affiliations.

This system uses ATMS and the IBM System 6 for automatic generation of correspondence, envelopes, and mailing labels. For example, when the Chancellor's Office desires to send out a mailing to the Chancellor's Club, the following is done:

1) The letter is entered into ATMS via a CRT located in the Chancellor's clerical services area.

2) A word processing request form is completed by the Chancellor's Office and sent to the word processing center stating where the letter in item 1 is stored on ATMS and what affiliation is desired for mailing.

3) The word processing center sends the request form to computing services and a batch program is run which extracts the names and addresses and sends them to the IBM System 6 located in the word processing center.

4) The word processing center instructs the System 6 to print the letter and envelope for the desired mailing that was coded in item 2.

The advantage of this new system is that it will allow the Chancellor's Office to remove roladex files consisting of over 3,000 records, plus save many hours of manual effort in searching the roladex file for mailing information.

A PRODUCTIVITY TOOL USED IN A JOINT DEVELOPMENT

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The University of Utah and Utah State University, long-time rivals in sports, entered into the unique relationship of performing a joint evaluation of a software package to determine its usefulness as a programmer productivity tool. After both schools purchased the software (ADMINS) and a PDP 11/70 on which to run it, a joint development project was undertaken for the preparation of a complete bookstore system. This was to include textbooks, inventory, point-of-sale terminals, purchasing, receiving and accounting for sales and expense with profit and loss information at the department level. Each University was to develop certain modules which had been reviewed jointly in design phase and then swap modules for implementation on the other's campus. A review of this total bookstore system and its cost development and maintenance will be discussed. The problems, frustrations, successes, benefits and usefulness of this productivity tool will be outlined and compared with the traditional tools available, along with suggestions for others who may undertake such an awesome venture.

OVERVIEW

UNIVERSITY OF UTAH

The University of Utah has a campus communtiy consisting of about 22,000 students and is decidedly a commuter campus with only a limited amount of on-campus housing available. Accomodations are provided for approximately 1,250 single students, and there are about 1,100 apartments available for married students.

The student body is served by approximately 3,500 faculty and a staff of about 7,500 including part-time people.

Administrative data processing is handled through one Computer Center dedicated to this function, other computers on campus being used for student activities and research needs. This Center houses an IBM370/145 with OS/VS and a PDP11/70. Most of the workload is handled on the IBM equipment, with applications for Parking Services, Stores and Receiving, High School Services and other smaller users on the PDP11/70.

UNIVERSITY OF UTAH BOOKSTORE

The Bookstore employs about 120 people with 70 being part-time. It is housed in a building containing about 45,000 square feet on three levels with an Auxiliary Store in the Medical Center.

Normal use requires the use of six to ten cash registers with 18 being required during rush. The volume of about five million dollars covers a wide range of merchandise including books, stationery, clothing, radio/stereo, cameras etc.

The cash registers at the Bookstore are NCR "Pont of Sale" units, equipped with the "wand" read feature, and they connect to two NCR Magnetic Tape Collectors. This system has been operational for the past five years, and provides sales and management reports using software originally developed by

NCR and later modified first by the Brigham Young University and later by the University of Utah.

The catalyst for the development of an on-line system was textbooks, which caused us to spend a considerable amount of time in studying systems developed by other institutions. We are indebted to them for their willingness to spend time in explaining their systems to us.

A requirements analysis was developed in early 1978 which was then used to determine the environment under which the system could be developed and run, and guided us in reviewing other systems available. We also obtained quotations from outside development groups.

UTAH STATE UNIVERSITY

Utah State University, in contrast, is primarily a resident campus located in the rural community of Logan, Utah which has a population of approximately 30,000. The University student body of 9,300 students is a major economic and social force in the area. Approximately 2,500 students live on-campus, and again, that many live in apartments close to the campus. Students come from all parts of Utah and from every state in the Union. There are 868 foreign students from over 40 countries attending Utah State University.

The faculty of approximately 950 is heavily involved in research, teaching and extension work and is supported by an additional staff of 1,100 persons.

The Utah State University Computer Center serves the Academic, Research and Administrative needs of the campus.

It has a Burroughs B6700 and a PDP11/70. The PDP11/70 was purchased by the Physical Plant and Auxiliaries on campus, but is housed in and operated by the Computer Center.

UTAH STATE UNIVERSITY BOOKSTORE

The Utah State University Bookstore is housed in the Student Center and has approximately 12,000 square feet of space, employs 80 people, half of whom are part-time, with an annual dollar volume of over two and a quarter million dollars.

The Bookstore is in the process of installing new 2140 NCR 7000 Series Point of Sale Terminals which will interface with the new system. This interface has not yet been developed because the terminals will not be installed until January 1980.

BACKGROUND

The University of Utah during the late Summer of 1977, discovered a programmer productivity tool called ADMINS, which runs on a PDP11/70. Utah State University was invited to participate in the evaluation of this tool. Both universities concluded that it was an excellent tool and purchased identical systems. Attachment A shows the original configuration at both schools. These configurations have changed as both schools have added additional memory and disk drives to their systems.

The State of Utah has an agency that monitors computer expenditures, Systems Planning and Computing. A joint development offered both universities favorable points politically.

A detailed evaluation was done before the purchase. A benchmark was prepared by the University of Utah, and the results demonstrated that ADMINS did in fact increase programmer productivity. The benchmark consisted of performing the following:

A. Create a file (s) from student data given on magnetic tape.

B. Prepare a minimum of three on-line display screens and one maintenance screen for student biographical and demographical data.

C. Program one recurring report to display/print transcript data for selected students.

D. Program two impromptu displays/reports.

Vendors were given the benchmark, which was designed to measure programmer productivity, not equipment performance. The results were as follows:

Vendor	Total
A - IBM (University of Utah estimate)	102 Hrs.
B - Burroughs	74 Hrs.
C - Microdata/Reality (Brigham Young University)	26 Hrs.
D - ADMINS (Computer Planning Consultants)	6½ Hrs.

The University of Utah planned on using their system for the Bookstore, Parking Services, Stores and Receiving and other small systems. In addition, they originally hoped to implement an on-line student registration system on it, but abandoned this later when some benchmarks were run, and it was determined that the 50 terminals they anticipated could not be supported with the desired response time. A similar test at Utah State University was made to determine the feasibility of converting an existing on-line registration system, but it too was abandoned. In this case, because of the lack of need to change and the inability to duplicate existing functions, (i.e. objectives could be reached, but operational procedures would need to change) it was decided to stay with the original system.

However, ADMINS was sufficiently impressive for less massive tasks, and because of its versatility and ease of use, it was determined to be the most cost effective tool to use to develop other systems. Systems currently on ADMINS and others planned for ADMINS are:

University of Utah	Utah State University
Stores and Receiving	Physical Plant
Parking Services	Inventory

Textbooks
Bookstore Accounting
High School Services
Research Office

Personnel
Stores and Receiving
Housing
Auxiliary Accounting
Bookstore Accounting
Textbooks

WHAT IS ADMINS?

ADMINS is a new approach to the design and operation of on-line administrative applications.

The ADMINS software consists of a number of related computer programs ("commands") that together form an integrated tool environment for the development and operation of administrative and management information applications.

These programs are operated on-line by a user at a terminal to perform a wide variety of functions on ADMINS files.

Once a sequence of ADMINS command steps have been developed to produce application results (e.g. to "run a Payroll"), then these command steps can be re-run automatically as a "turnkey" application. On the other hand, the high level instruction languages of ADMINS facilitate application changes as the need arises. In many instances, these application changes can be made by the end users themselves.

Do not think of ADMINS in terms of traditional programming. It is less than a set of programs in the traditional sense, for it contains nothing which dovetails to your application. In the final analysis, probably none of its programs does things exactly as you would wish if you were giving program specs. At the same time, ADMINS is a great deal more than you would have if you wrote these specs youself, for its flexible tools can do hundreds of jobs where your application programs will do only one. Nor is ADMINS a programming language itself - its syntax is more usable by non-systems people than most other programming environments (a systems background though, is a great help in doing complex applications).

ADMINS is not all things to all people. Its strengths are in data analysis and reporting, screen processing, and file manipulation. It is weakest in calculation areas, where its facilities are basically add, subtact, multiply and divide. Square roots, floating point calculations, standard deviations and other similar computations are not supported.

In general then, ADMINS is a new concept in computer software. It is a system in which standardization can be brought to application implementation through the use of flexible but standard tools. Once a user understands how the ADMINS tools are used, he is bounded only by his own creative ability to apply those tools to his uses.

MAJOR FUNCTIONS

1. Acquisition of external data (EBCDIC of ASCII) from magnetic tape prepared on other computers and preparation of external tapes from data in ADMINS files for use on other computers.
2. Definition of record structures and creation of disk files to hold these record structures.
3. File manipulation operations for creating subsets, new sort orders, summaries, and aggregations of data in ADMINS files for further use.
4. CRT based update, query and display against one or several related files using a standard "data terminal" with a standard clerical interface.
5. Report generation to produce administrative forms (e.g. bills, checks, form letters), and both simple and complex management and analytic reports.

6. Computation and recoding of values using program-like conventions, decision tables and either simple or complex algorithms.
7. File linkage operations to relate files both in anticipated and unanticipated ways, either on a record-by-record basis or by linking whole files to whole files.
8. Data base administration functions such as file backup and restoration, transaction logging, disk space management and resource accounting.
9. Word Processing: maintaining complex documentation for producing simple business correspondence. ADMINS word processing provides such facilities as controlling margins, indentation and footnoting, and cross referencing out of one text file into another. In each case the ADMINS command programs are designed for on-line interactive use by end users, i.e. clerical and management staff. There is also the facility to run prepared sequences of ADMINS commands under control of user prepared "command files".

On-line messages, displays, and test modes-of-operation are used to make visible the data operations being performed, and to help the user to see how the ADMINS operations are affecting the data on a step-by-step basis.

THE JOINT DEVELOPMENT

While going through the evaluation process, it became apparent that both schools were interested in developing an automated on-line bookstore system. It was at this point that the decision was made to explore the possibilities of a joint venture. The requirements appeared to be almost identical, and both universities were looking at the same hardware using the ADMINS software package. In fact, it had all the makings of a very exciting project.

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A project committee was quickly formed utilizing expertise from both institutions. The ground rules were set, dividing responsibilities between the universities, with Utah State University developing the accounting package, and University of Utah developing the textbook package.

Managers of the two bookstores were charged with the responsibility of close cooperation for identifying specific requirements and providing guidance. Project leaders were charged with responsibilities of development, using a free hand to develop systems following guidelines laid down by the managers, as well as the responsibility to interface the two packages upon completion.

It was obvious from the start that the needs of the two institutions would on occasion be at variance, and that we would agree to disagree on some points. It was therefore important that provision be made to allow for easy modification to accomodate these variances, making ADMINS a natural.

It was fortunate that expertise both in financial accounting and in textbook handling was available. The textbook buyer at Utah State University had a very firm understanding of what was required and was very aggressive in setting forth his ideas. The need for documentation was soon apparent, however. During the course of the project, the University of Utah had a change in directors of the Bookstore followed by two changes in the chief accountant. At Utah State, the textbook buyer left in the middle of the project, but fortunately gave us the benefit of his understanding before he left.

BOOKSTORE ACCOUNTING

PROJECT TEAM

The project committee at Utah State University consisted of the Manager of Administrative Systems and Programming, Accounting Supervisor for the Bookstore, Supervisor for Auxiliary Accounting from the Controller's Office and two Systems Analysts from the Computer Center. Originally the Textbook Buyer was a part of the team, but he terminated after the design was done and was not replaced on the project.

It should be noted that the Accounting System was designed in such a way as to be an Auxiliary Accounting System for all Auxiliaries on the Utah State University campus. It is intended to be only a Bookstore System at the University of Utah. ADMINS lends itself to being easy to modify, and the modifications needed for various areas will be relatively simple to make.

SYSTEM OVERVIEW

The Bookstore Accounting System is a very complex process. The problems of interfacing the bookstore accounting functions with the controller's functions, which were different for the two institutions, were challenging.

The system is designed as a quasi open item system, keeping track of individual detail in some cases, and in others, treating the processing as a balance forward, using totals and ignoring the detail. The problems of credit cards usage and on-campus department purchases added to the complexity of the system.

Within the system the following modules were identified:

- Requisition & Purchase Order Processing
- Receiving
- Invoice Processing
- Line Item Input
  - Special Input
  - Payment Cycle
  - Expense Processing
- Month-End Processing
  - General Ledger Reporting

Inventory Reporting

Controller's Interface

Sales Accounting

Textbook Interface

Attachments B and C give an overview of these modules and how they interface with each other.

REQUISITION AND PURCHASE ORDER PROCESSING

The goal in automating the purchase order processing was to provide an effective means of tracking all purchases through the entire purchasing process. Once the requisitions are input to the system and pass through the editing process correctly, a purchase order is created. This purchase order becomes the means of tracking the purchases with both receiving and invoicing information required by the system before a payment is authorized. This created some payment problems until we acquired adequate controls to assure that all steps required to authorize or activate a payment were met.

RECEIVING

The receiving module's primary concern is the tracking of goods received by purchase order. They are received by purchase order line item identification. Damaged merchandise is also identified and monitored.

INVOICE PROCESSING

The primary function of the invoice processing is to request payment for goods purchased. The normal procedure ties the invoice back to its originating purchase order and requests payment by purchase order line number. These are input through the special invoice process which only refers back to the originating purchase order. The secondary function for the invoice processing is to capture the data needed to maintain our inventory figures by the retail method along with other reports to make purchasing more effective.

After invoices have been entered, edited correctly, and sufficient goods have been received to cover the invoice, they will automatically set up a payment request when the payments process is run. Since Utah State University is not allowed to print checks at the Bookstore for payment, a payment advice is generated which is sent to the Controller's Office for payment. After payment has been made by the Controller, a tape of check numbers created from the payment advices is created. These are merged back into the system to provide an audit trail from the purchase order through the invoice to the check payment for the purchase. The University of Utah handles this portion of the system differently.

EXPENSE PROCESSING

The following expense transactions are a normal part of a bookstore operation:

- Cash Refunds
- Cash Purchases - Text and Misc.
- Journal Adjustments
- Mark Ups and Mark Downs
- Special Purchases
- Special Returns
- Stock Transfers
- Withdrawals
- Vendor Refunds

These transactions are captured and edited via special expense procedures. The information is then retained for month-end processing.

MONTH-END PROCESSING

On a monthly basis, current invoice and expense information is extracted from the permanent files. This information is used to update year-to-date general ledger, price change and inventory files, generating month-end reports.

The retail method of calculating inventory is used, monitoring inventory by product classifications. Finally, an interface to the Controller's Accounting System is created.

SALES ACCOUNTING

There are three major types of sales information to be captured and handled by the system. The first is cash sales which are captured to provide adequate methods of controlling the cash flow. The second type of sales is on-campus charge sales. These sales are captured and interfaced with the Controller's Office on a monthly basis to transfer funds between the purchasing department on campus and the Bookstore. In the case of Utah State University, the transfer between the purchasing department and other auxiliaries is also handled. The third type of sales is regular off-campus accounts for which an accounts receivable system is maintained. Provisions are made for interest-free accounts and 30-day net with interest accounts. Plans include revolving charge accounts in the future.

ADDITIONAL FEATURES

To provide sufficient auditing procedures, a scheme has been implemented to permit selected individuals to use only various phases of the system. The audit system is simple but effective. Input transactions and corrections carry the identification of the individual inputting them along with the time, date and terminal number.

The security system is also straight forward. By requiring each operator to log on through a major security menu, it is very easy to validate the operators by their knowledge of their own special password and to control the segments of the system that each operator is allowed to access.

The system provides rapid entry of information while maintaining tight control over the accuracy of the data. Entries are not edited at input time. The standard process is to input data, edit in a batch mode, and make the necessary corrections until the input is clean.

BOOKSTORE TEXTBOOKS

PROJECT TEAM

The project committee at the University of Utah consisted of the Assistant Director of Systems, the Chief Accountant of the Bookstore, the Textbook Buyer, and a Systems Analyst.

As each step was approached, the design was laid out before the committee describing all options available, and in the final analysis, it was the user who made the decisions. The system was broken down into small segments with an estimate of both cost and time, and monthly reports were prepared by data processing giving actual costs vs. estimates, explaining variances whenever they occurred.

SECURITY

Security in this system is achieved at the operator level. Each operator has a security word assigned with bytes corresponding to each screen within the system. Upon sign-on, the operator number is captured by the system, and held to determine authority for entrance into the screens requested. If the operator does not have the correct byte set for the screen requested, the system will deny access.

A complete audit trail is maintained, providing a file of all entries made into the system including the time, date and operator number.

UNIT CONTROL

The International Standard Book Numbering System (ISBN) is the basis of control through the whole system. As the name implies, it is used internationally, and is controlled in the United States by the R. R. Bowker Company. Practically all books already have a number assigned, and it is a relatively simple task to assign numbers to local publications. A modulus 11 check digit is part of this number, which is beneficial in preventing transposition and keying errors.

Attachment D illustrates the makeup of the ISBN number.

EDITS

Edits were considered at great lengths, and it was decided by the committee that all entries must be correct at the outset or else rejected. The system was built around this concept with the option, in some cases, to override the edit when necessary. Comprehensive edits were developed and offending entries were rejected, indicating the fields failing the edit.

SYSTEM FLOW

It turns out that the textbook buying function is far from being a normal inventory and purchasing system, but involves many complex decisions, some of which still need to be made by the buyer.

One of the complexities of the system is that of tracking three Quarters at the same time, often involving the same book. The previous Quarter would just be concluding, the current Quarter completely active and the following Quarter just commencing the buying cycle.

The on-line system of data screens is built around the menu concept with the ability to branch to appropriate screens as necessary, provided the operator has security clearance.

Attachment E illustrates the branching capability along with clearance necessary to execute each branch.

The backbone of the whole system is the buyer's work sheet, a copy of which is shown in Attachment F. A work sheet is produced for each class, obviously generating multiple work sheets for some books. However, on each work sheet the class is shown in the heading, and at the foot of the report is a listing of all other classes using the same book with the estimated enrollment of each class.

SYSTEM IMPLEMENTATION

It was felt that the best way to implement the system would be to have a representative of the development team from one institution assist in the implementation at the other.

Files had to be created of books with their ISBN numbers, most of which could be obtained from Bowker's publications, but which had to be entered manually. A publisher file was created using information available along with the number system developed by the University Accounts Payable Department.

Sales reports at this time have not been changed. They will be changed and enhanced as soon as the ISBN number is incorporated into the bar code read by the "wand" at the point of sale.

FUTURE PLANS

As the textbook operation along with the accounting package becomes stabilized, the general book area may also be incorporated into the system, probably phased in by category and using the ISBN numbers assigned to them.

IN RETROSPECT

Looking back over the course of this project, there are a number of things that could have been improved. It is not the intention of this paper nor will it serve any good purpose to point out areas where there may have been deficiencies, but rather to indicate the areas that need the most reinforcement in such a venture. The same principles apply in a joint venture as they do in a project of any kind. There is a tendency to procrastinate, underemphasize or even forego established procedures unless the environment is strictly disciplined. Areas which need close attention are:

.REQUIREMENT DEFINITION

The requirements for this project had been defined and the document written before the possibility of a joint venture was envisioned. When that decision was made, the principals at Utah State University reviewed the document and agreed to the contents.

PROJECT COMMITTEE

It is essential that one person should have overall responsibility for the project. This person should be a strong individual with sufficient authority to call meetings and to enforce guidelines etc., having the personality to achieve support without being abrasive.

Members of the committee should obviously represent the areas under consideration, in this case textbook management, accounting management, and the responsible people in data processing areas. Both institutions should be equally represented in each area.

DATA PROCESSING

The obvious charter of this department is to participate in the development of the requirements document, advising where necessary, but faithfully developing the document to illustrate the true requirement as visualized by the user.

Every phase should be developed with the needs of the user in mind, advising him of options and guiding him when necessary. It is easy to be carried away in the enthusiasm of the project, but it is the user who foots the bill, it is the user who will own the end product, and it is the user who should call the shots.

PROJECT REVIEWS

At every phase of the project a review should be held by the project committees in the individual institutions followed by a joint review called by the overall project leader. The two environments may not be identical even though hardware and software are. It is necessary therefore that all be aware of what is anticipated so as to evaluate the impact on their own evironment. As an example, if a great deal of batch processing is required overnight, the impact may be that there is not enough time to process along with time that has already been committed.

People tend to be absorbed in their own assignments, but it is essential that all participants in the review completely understand or are prepared to ask appropriate questions on the project under review. It is likewise important that egos are set aside so that constructive criticism may be offered and accepted in a free flow without offense.

Every call for a meeting or review should be accompanied by an agenda. This allows all to be prepared to intelligently address themselves to the points under consideration, and it will eliminate the element of surprise.

Likewise, confusion and misunderstandings are avoided if someone is appointed scribe so that the meetings may be documented and distributed to all participants to verify findings and decisions.

DOCUMENTATION

Documentation is a key point in a venture of this sort. It is most important and cannot be overstressed. Documentation can be overdone to the extent of redundancy, to the impossibility of maintenance or overkill on minor projects. In the case being described, however, there are not only two programming teams at work, but also two departments at two different institutions as well. Documentation is critical.

Each phase should be documented, with the overall project leader orchestrating the whole thing. Each document, as it is finalized and approved, should be signed by all participants. The signature should never be a mere formality, but should mean that the signer understands and accepts the document. It may not necessarily mean that each individual agrees. It does mean that all participants will conform to the document.

Copies of the document should be provided to each participant well in advance of the meeting so that each may obtain a full understanding of it before the meeting convenes. Following the meeting, the document should be corrected, if necessary, and redistributed.

ADHERANCE

Once a document has been accepted and/or a decision made, it follows that everyone will be expected to adhere thereto, and deviation may only be made upon agreement of all, and then such deviation must be noted and initialed. Only by complete cooperation and strict adherance to decisions and guidelines, can effective harmonious results be achieved.

CONCLUSION

It is not easy at this point to quantify the cost effectiveness of the system, but the directors of the bookstores and the data processing departments at both institutions have confidence in the future. The system is being received by operating personnel at the bookstores with enthusiasm, and this can only spell success. ADMINS has established itself as a programmer productivity tool. When the opportunity arises for another joint venture, the experiences gained from this venture will be of great benefit.

DEC PDP 11/70

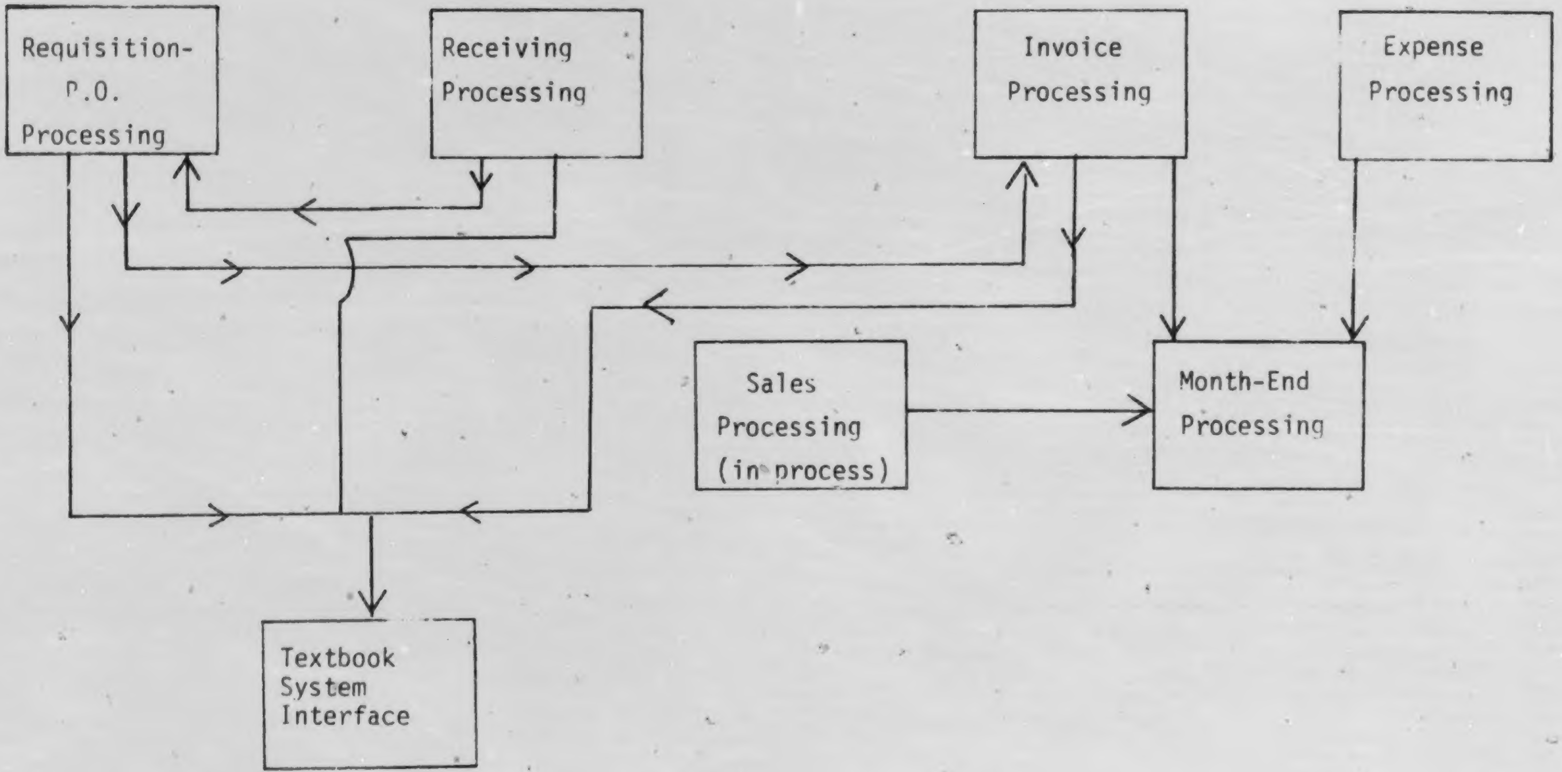
EQUIPMENT CONFIGURATION

Model Number	Description	Size	Number of Units
PDP 11/70	11/70 CPU	128KW	1
MJ11-BE	64 KW Memory Modules	64KW	2
LA36	Console Terminal	30 CPS	2
DZ11-E	Multiplexer	16 lines	1
QP30-AD	FORTRAN Compiler		1
-	IAS Software (Version 3.0)		1
TWE16-EA	Magnetic Tape Drive and RH70 Controller	800/1600 BPI	1
RWM03	Disk Drive and RH70 Controller	67MB	1
RM03	Disk Drive	67MB each	2
9400-2	System Industries Dual System with RH70 controller	80MB each	2
LP11-WA	Line Printer	300 LPM	1
B160	Beehive Terminals with special features	1920 char	8
B162	Beehive Terminals w/detachable keyboard & special features	1920 char	8
VT52	DEC Terminal		1

ATTACHMENT A

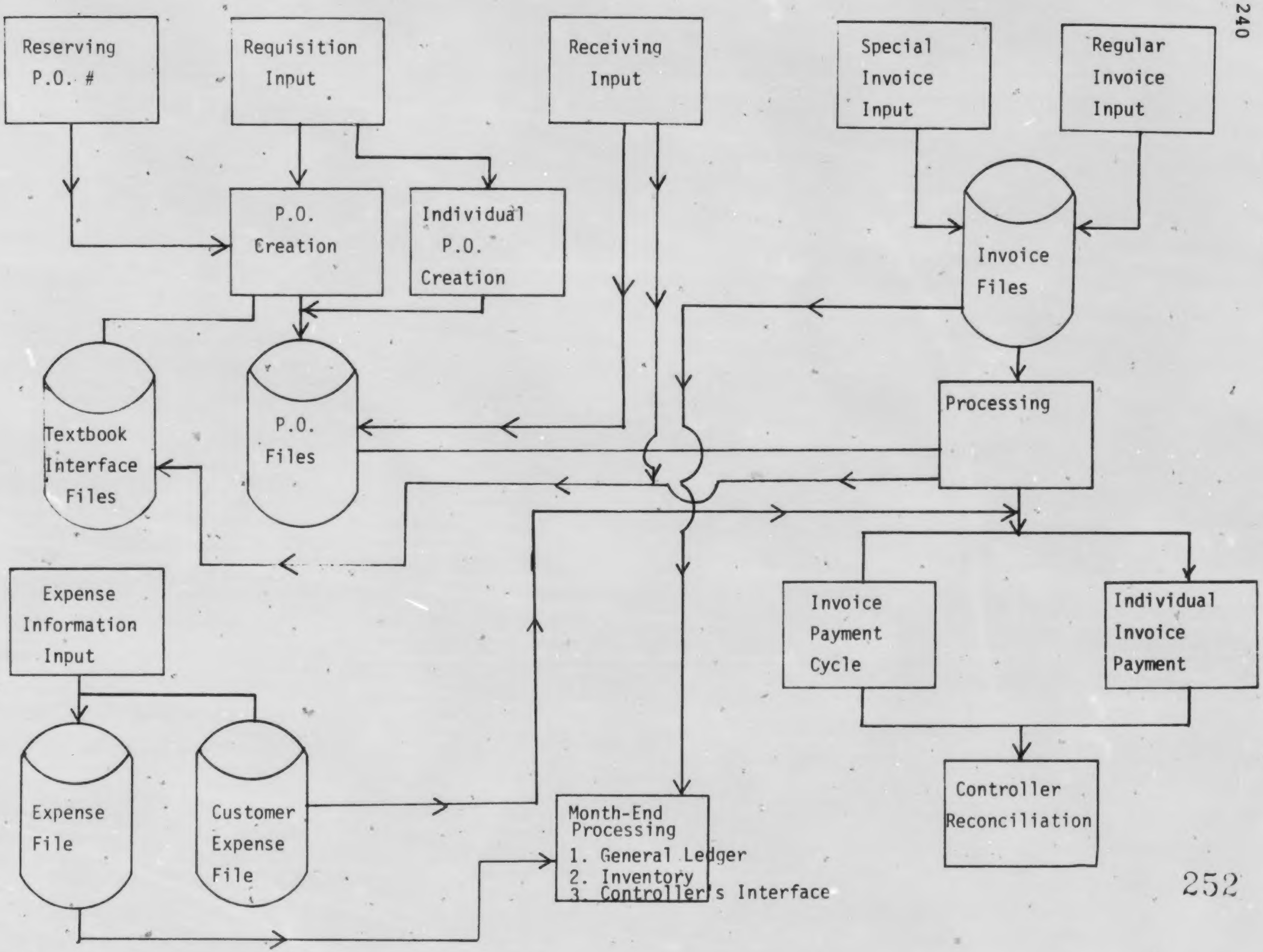
ATTACHMENT B

BOOKSTORE ACCOUNTING MODULES


Requisition-P.O. Processing
Receiving Processing
Invoice Processing
Expense Processing
Sales Processing (in process)
Month-End Processing
Textbook System Interface

ATTACHMENT C

BOOKSTORE ACCOUNTING INTERFACES


Reserving P.O. #
Requisition Input
Receiving Input
Special Invoice Input
Regular Invoice Input
P.O. Creation
Individual P.O. Creation
Invoice Files
Textbook Interface Files
P.O. Files
Processing
Expense Information Input
Invoice Payment Cycle
Individual Invoice Payment
Expense File
Customer Expense File
Month-End Processing
1. General Ledger
2. Inventory
3. Controller's Interface
Controller Reconciliation

It's Speedier By Number

An ISBN consists of ten digits, made up of the following parts:

	Group Identifier	Publisher Prefix	Title/Edition Number	Check Digit
Example 1	0	15	118992	7
Example 2	0	911216	08	1
Example 3	90	7000	234	5

INTERNATIONAL STANDARD BOOK NUMBER MAKEUP

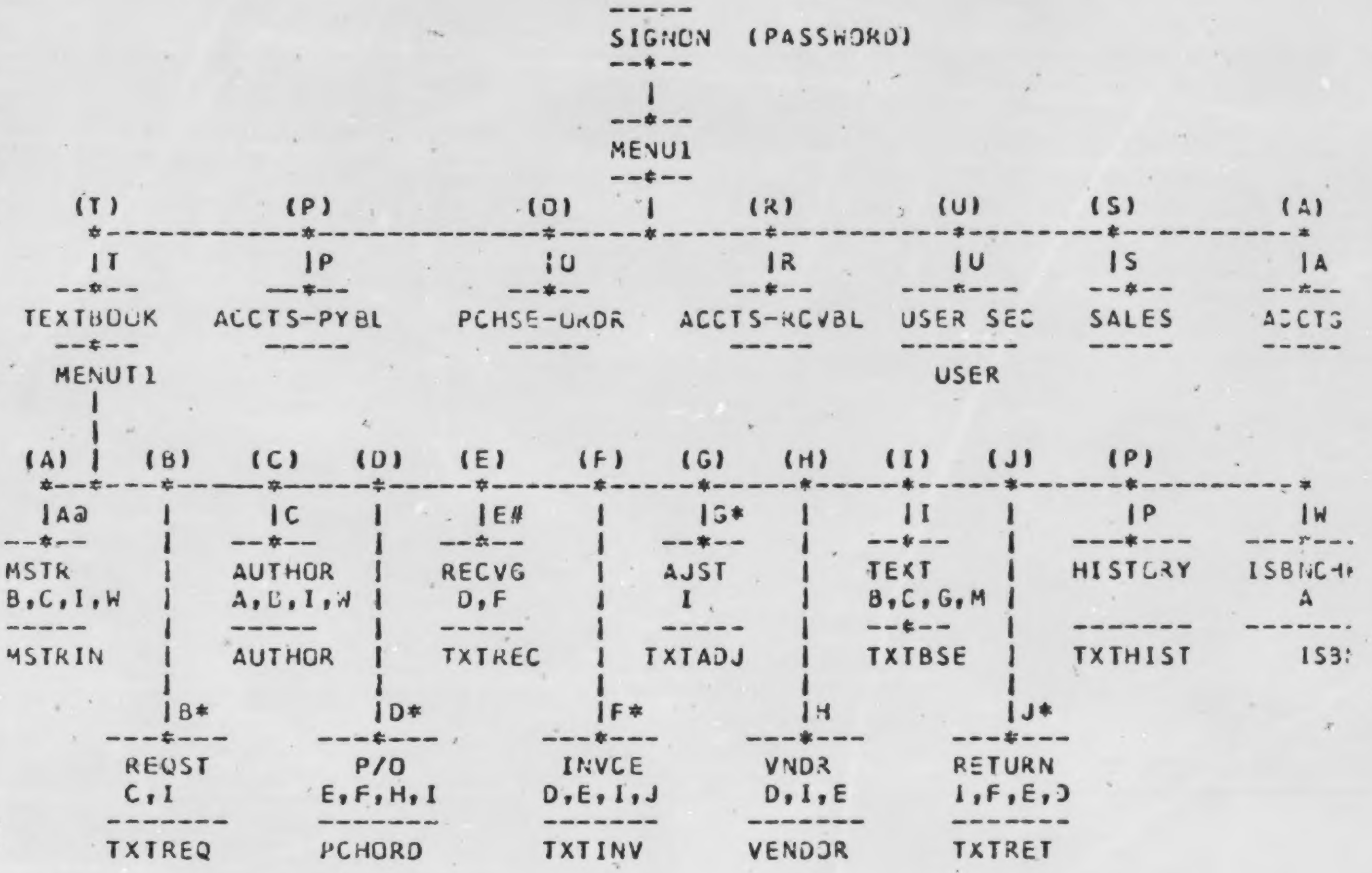
The size of the *group identifier, publisher prefix* and *title number* varies according to the title output of the group and publisher concerned. English language publications are the most numerous and thus have a small group identifier **(example 1 and 2).** Dutch publications are fewer in number, thus their group identifier is larger **(example 3).** A large publisher has a small prefix **(example 1)** to allow for more title listings. A small publisher has a large prefix **(example 2)** because it does not have many titles to list. The *check digit* is always a single figure; it guards against a computer accepting an "invalid number."

isbn
International Standard Book Numbering Agency
Emery Koltay, Director
R. R. Bowker Company · A Xerox Education Company
1180 Avenue of the Americas
New York, N.Y. 10036 212/764-3384

ATTACHMENT D

Reproduced on 6500 Xerox color copier

UNIVERSITY OF UTAH BOOKSTORE
SCREEN HIERARCHY & RESTRICTIONS


SIGNON (PASSWORD)
MENU1
(T)
(P)
(O)
(R)
(U)
(S)
(A)
T
P
O
R
U
S
A
TEXTBOOK
ACCTS-PYBL
PCHSE-ORDR
ACCTS-RCVBL
USER SEC
SALES
ACCTG
MENUT1
USER
(A)
(B)
(C)
(D)
(E)
(F)
(G)
(H)
(I)
(J)
(P)
A@
C
E#
G*
I
P
W
MSTR
B,C,I,W
MSTRIN
AUTHOR
A,B,I,W
AUTHOR
RECVG
D,F
TXTREC
AJST
I
TXTADJ
TEXT
B,C,G,M
TXTBSE
HISTORY
TXTHIST
ISBNCH
A
ISB
B*
D*
F*
H
J*
REQST
C,I
TXTREQ
P/O
E,F,H,I
PCHORD
INVCE
D,E,I,J
TXTINV
VNDR
D,I,E
VENDOR
RETURN
I,F,E,D
TXTRET

ALL SCREENS WILL RETURN TO MENU1 USING BRANCH 'X'.
ALL SCREENS RETURN TO MENUT1 USING BRANCH 'Y'.
ALL SCREENS RETURN TO SIGNON USING BRANCH 'Z'.
LETTERS IN PARENTHESIS INDICATE SECURITY WORD CODE LETTER.
SIGN-ON NUMBER = 4 BYTES.   PASSWORD = 4 BYTES.
SYSTEM SECURITY WORD = 10 BYTES (EACH BYTE = AUTHORITY FOR RESP. SYSTEM).
TEXTBOOK SUBSYSTEM SECURITY WORD = 12 AUTHORIZATION BYTES.

SCREENS ACCESSED DIRECTLY WILL BRANCH TO THE SIGNON SCREEN.
* = ISBN MUST BE ON FILE. # = PCHSE ORDER MUST BE ON FILE.
@ = CHECK DIGIT ROUTINE.   NEW ISBN MAY ONLY BE ENTERED THROUGH SCREEN A.
INVENTORY ADJUSTMENT IS MADE ONLY THROUGH SCREENS E, G AND J.
HISTORICAL DATA ON REQUESTS MAY BE PUT OUT TO TXTHIST.MAS BY BRANCHING TO 'P' FROM THE TEXTBOOK MENU SCREEN.
THE SCREEN ISBN (BRANCH 'W') IS NOT PASSWORD PROTECTED, AND MAY BE ACCESSED DIRECTLY SINCE IT IS USED ONLY TO COMPUTE A CHECK DIGIT. IT HAS NO EFFECT ON ANY FILES.

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                                   UNIVERSITY OF UTAH BOOKSTORE
                                    TEXTBOOK BUYERS WORKSHEET
29-MAY-79                                                                                          PAGE 1
REPORT: TXTWRK

DPT: ENGLI CLASS:  100 SECT:   10 QTR:  792 INSTR: DENNIS CROCKER  EXT: 3334 DATE: 12-APR-79 TIME: 12:00 CAP:  100
                                                                     WKD : 25-MAY-79
ISBN: 456-82-2707-0 TITLE: DATA PROCESSING
PUBLISHER: UTAH STATE      COPYRT: 79      PRICE: 15.63   COV: P          REQ/OPT:  Y  NEXT/USED: 794     OPER: 8
NOTES:
           ******** INVENTORY ********         EST.      ACTL  USED   EST.    EST.    NEW     USED   TOTAL  EST.   ACT.
 TERM      TOTAL  NEW  LOC.      USED  LOC.   BUYBK FM  BUYBK PUR.  SALES O/STOCK  SALES   SALES   SALES  ENR.   ENR.
  792        15   30             -15            46   Y     50  400     26     29     569     29     598    50     48
  791                                           23   Y     24   25     26     29      27     28      55    30     31
  784                                           10   Y     11   12     13     16      14     15      29    17     18
  783                                           30   Y     31   32     33     36      34     35      69    37     38
  782                                           10   N     42   43     44     47      45     46      91    48     49
  772                                           90   N     91   92     93     96      94     95     189    97     99

OTHER USAGE:
                          EST.  REQ/
DEPT. CRS   SCT.  TERM    ENR.  OPT.  INSTRUCTOR       EXT.  WKD
ENGLI 100    10    792     50    Y    DENNIS CROCKER   3334 25-MAY-79
MATH  103    11    792     20    Y    JUDY             3304 15-MAY-79
PHY   101    11    792     10    Y    RON SMITH        3340 20-MAY-79
```

ATTACHMENT F

The User Oriented Design: What Can Go Wrong, A Case in Point

by

Stephen E. Coury

The University of South Dakota

1. OVERVIEW

1.1 THE USER ORIENTED CONCEPT

The phrases "user involvement" and "user design" have become the bywords, or more accurately, the buzzwords, of the systems analysis and design subculture. One perception of data processors is that they are not responsive to user needs. In the interest of improving their image, computer people may claim to aspire to the concept of user involvement. Regardless of the degree of user involvement and input, the end product may very well turn out to be only what the computer center wants or thinks it should be.

1.2 THE CASE STUDY

Presented in this paper is a case study of a user oriented design that was undertaken as a joint effort between the user representatives and the data center. It illustrates where problems of concept definition, group organization, and project responsibility created a significant project impass in the development of the institution-wide Student Data Management System (SDMS).

The opinions expressed in the following paper are solely those of the author. It is the opinion of the University of South Dakota that the paper does not reflect accurately the successes and failures of the project.

2. THE USERS AND DATA PROCESSING

2.1 THE USERS

2.1.1 Identification of the User

The topic of what the user's role should be in a systems development effort abounds in the literature and is a popular topic at many "systems" conferences. It is suggested that a source of confusion in the DP-User relationship is the definition of the user role concept. Differences in opinion and in perspective are just a couple of reasons why the word "user" may take on different interpretations. This word may refer to the "end user," the "user department," the "user community," or the "user representatives." Who or what group is really identified when we say "user" may significantly impact the system design and the evaluation of that design. Consider Example 1, for an admissions system application. Notice how the comments and questions following each of the identified users illustrates a different user need or system requirement. It becomes clear that if a system were designed to address a subset of the illustrated needs, it may fall short of addressing the needs of the "big picture."

2.1.2 Degree of User Involvement

User involvement is advocated in varying degrees. Some authors recommend merely user "contact," which some consider "pseudoparticipation." Others, on the other hand, advocate

Example 1

User Needs and Requirements in an Admissions System

- Student
  - "Have I been admitted to the University?"
- Terminal Operator
  - "Response time really effects my productivity."
- Department Manager
  - "How many applications were processed today?"
- Division Head
  - "Are enrollments projected to be above last year's?"
- President
  - "Should we budget more dollars to the recruitment of prospective students?"
- Board of Regents
  - "What impact would a change in admission criteria have on the size of the incoming freshman class?"
- Representative Group or User Liaison
  - "The system must be a user oriented management information system."

much greater participation. Lucas strongly recommends that "users should design their own systems." He means this to say that the user should actually perform some of the tasks normally carried out by the analyst."[1] User participation, therefore, falls somewhere on a continuum from no user involvement what-so-ever, to the user acting as a business analyst, as is indicated in Illustration 1.

---

[1] Lucas [1976:60]

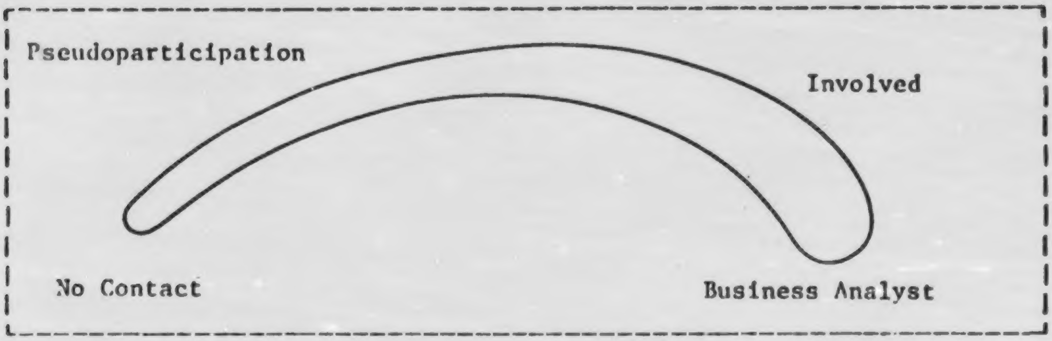

Illustration 1: The Continuum of User Involvement

2.1.3 Definition of Design

Confusion may also result with the definition of the word "design." Understanding exactly what is meant by design may prove difficult. Consider Example 2, note that each of the items listed at some level or another may be interpreted as a design.

Example 2

Different Interpretations of Design

- * wish list
- * functional description
- * IPC (input, process, output) documents
- * process flow diagrams
- * HIPO (hierarchical input, process, output) charts
- * program specifications
- * object modules (machine code)

To compound the effect of uncertainty in systems design, these two concepts are merged together to form the reputed "user design."

2.2 DATA PROCESSING

2.2.1 Rapid Change

Data processing shops, in general, share many experiences. They all have been witness to the explosive change that has been taking place in computer technology over the past few years. Most of them have been under some sort of pressure to keep up with modern technology, and to improve the level of service they deliver. And many, unfortunately, have poor reputations with their respective user communities.

Lecht, in his book, The Waves of Change, gives us the following bit of insight to this problem.

> By the mid 1970s "end-users" were far removed from the computer room, and many data processing departments were too busy supporting and maintaining current, but old, applications. Many, bogged down this way, became totally unresponsive to user needs.[2]

2.2.2 Misunderstanding

Data processing also has the problem of being misunderstood. As Gane and Sarson point out, people in the user community know relatively little about data processing, and the propaganda about computers may leave people without any specific or accurate ideas about what computers can or can't do.[3]

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[2] Lecht [1977:2]

2.2.3 The DP Campaign

Naturally, in the interest of improving their image, computer people may aspire to the concept of user involvement. This boast of being a user oriented shop may only be a verbal campaign. Beware the user who is willing to take his computer center up on an offer to join in the design effort! One may very well find out that these slogans mean only what the data processing department wants them to mean. That is, user involvement may be "DP-defined." In fact, some computer centers may be reluctant to give up the priviledge of being able to shape the user's world and to determine his information destiny. Regardless of how involved the user gets, the end product may still turn out to be only what the computer center wants or thinks it should be.

2.2.4 The Traditional Role of DP Staff

A look at the traditional roles of the users versus that of the people in data processing clearly shows that there is a change in the way of doing things basic to the proposal of user involvement. Historically, the users come

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[3] Gane and Sarson [1979:2]

from a "hands off" background where they knew little about computers and wanted little to do with the design of their systems. Programmers, on the other hand, come from a history of doing "their own thing" and delivering systems to users as a result of a "one-man-show." Sometimes the technical world is taken off-guard by the "computer-smart" user, and is unwilling to allow the user a significant part in the design. It is the feeling of the author that problems of this nature stem from the inherent difficulty of converting "architects" to "contractors."

2.3 THE LESSON

There are two basic points to be learned from this section, they are:

1. The definition of the words "user," "user involvement," "design," and "user design" may impact the shape of the system.

2. User oriented design concepts may encroach upon the traditional analysis and development roles of persons involved in data processing.

3. THE CASE

3.1 BACKGROUND AND ENVIRONMENT

The University of South Dakota is a relatively small midwestern institution. Enrollment nears five thousand combined undergraduate, graduate, and professional students. The computer power is unique for an institution of this size. The central facility mainframe CPU is an IBM 370/3031 with three megabytes of main memory with well over sixteen megabytes of online storage. The software is state-of-the-art, supporting a database management system (DBMS) and two TP monitors.* This computing system is shared statewide with a branch campus and three other South Dakota state colleges, as well as with some areas of the state government.

Following are some excerpts from past SDMS reports which give light as to the nature of the current applications software and as to why a project of this nature was undertaken.

> Historically, computer-augmented systems within the University were designed primarily to solve operational problems such as printing class lists or printing address labels. Information needs for the whole sphere of planning and decision making were not addressed. What has resulted are "data processing systems," not "management information systems."
>
> During the last ten years various departments on campus have worked on better ways to deal with student data. Much of this effort resulted in computer programming to handle the data storage,

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*ADABAS is the DBMS, and COM-PLETE and TSO are the TP monitors.

> data sorting, and reporting associated with each department. The way in which this was done was to computerize applications selected from the functions of the individual departments. Examples of this are the registration system for the Registrar and the student accounts receivable system for the Comptroller. The main thrust of each of these efforts was to make the job easier for the department involved -- to help them be more productive, if you will. These efforts, therefore, tended to be bounded by the organizational units and were primarily directed at making specific functions more efficient.
>
> The major impetus for suggesting that a new student data management system be developed is that over the last decade, the current student records system has been patched together, adding layer upon layer of temporary fixes so that it is nearly unintelligible, unmanagable, unresponsive, and lacks flexibility. The computer support systems are fragmented, expensive, poorly documented, poorly understood, inadequate, unreliable, and have reached the end of their effective lives. Thus, the rippling effect of a change to the system is not really known. There is reluctance on the part of the system's users to make the desired changes because of the fear that the entire system may collapse.[5]

As one can see, the administrative organization of student information at the University of South Dakota has not been one of its more outstanding features. In an attempt to improve the information environment, substantial efforts, expenditures, and commitments have been made to develop new systems designed to solve the problems of today and to provide for the needs of tomorrow. This began as a joint venture between user areas and the computer center, spearheaded by the users. A methodological approach was used to address the student information needs of the institution at the global level. The project was called the Student Data Management System (SDMS).

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[5] USD Report [1978:3,6] and USD Report [1979:7-8]

After one and a half years of planning and review, the programming for the first subsystem began. Within a few months it became apparent that the project had "hit the rocks" and was doomed to an inevitable failure.

3.2 THE PLAN

Every institution, including USD, has its share of both people and political problems. The SDMS Project had its share of both, however, these alone do not account for the misfortune that the project suffered. Let us examine the definitions and relationships that existed.

3.2.1 The Organization

3.2.1.1 The User Community

The various meanings of the word "user" were recognized by the people involved in the SDMS Project. It was thought by the user community in general, that a "user representative" would be the means by which the institution's needs and requirements could best be represented. A re-allocation of existing resources, called for a systems analyst (the author) to be employed. New staff support of about one (1) full-time equivalent (FTE) was also provided, making the user group total two (2) FTE.

The thought behind using a systems analyst as the user liaison was to utilize someone who could interpret the needs of management and the needs of the user department, balance these with existing technologies, and then proceed to articulate these needs in a precise fashion, meaningful to the technical community.

The user team was also given the support of the application area. The first phase of the project was to address the admissions function of the University, thus time contributions were made by the staff of the Undergraduate Admissions Office.

The user group was hence organized as shown in Illustration 2.

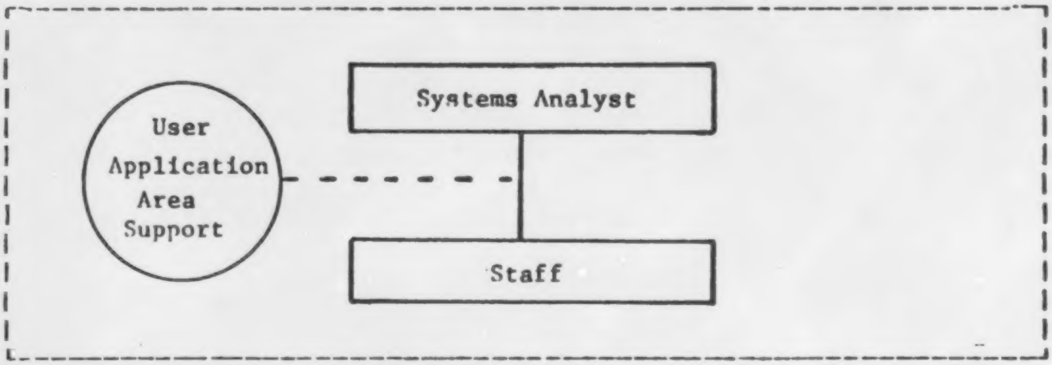

Illustration 2: The User Organization

3.2.1.2 The Technical Community

The organization on the technical side was composed of many more people. The staffing varied from about three (3) to seven (7) FTE, almost all of which was funded by new monies. The structure of the technical community can be seen in Illustration 3.

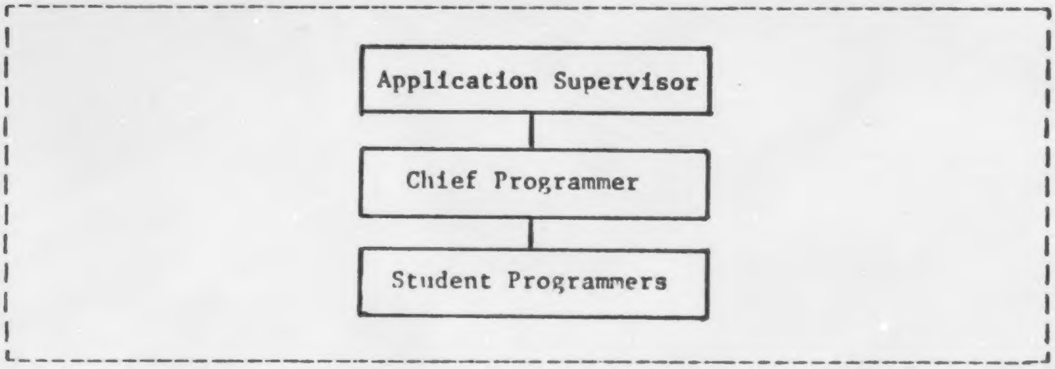
Application Supervisor
Chief Programmer
Student Programmers

Illustration 3: The Technical Organization

3.2.1.3 The User-DP Relationship

The two groups were referred to as the "User Community" and the "Technical Community." Their interaction was horizontal in nature, as can be seen in Illustration 4.

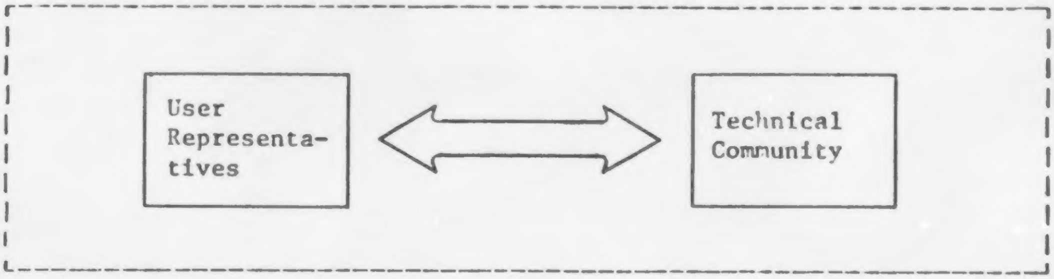
User Representatives
Technical Community

Illustration 4: The User-DP Relationship

3.2.2 Areas of Responsibility

3.2.2.1 The User Responsibilities

Many of the tasks that were undertaken by the User Community are listed in Example 3.

Example 3

Some of the User Responsibilities

- * Define the data elements as they pertain to the application area.
- * Establish the coding schemas.
- * Define the data relationships.
- * Provide the programming staff the defined tables and/or algorithms as required for the verification of data.
- * Supply the necessary decision tables for functions which are to be automated
- * Lay out and define the data screens and the use of the function keys as requested by the computer center.
- * Provide a functional description of what the system is to do and how it is to behave.
- * Write the user documentation.

3.2.2.2 The Technical Responsibilities

Some of the responsibilities of the technical community are listed in Example 4.

Example 4

Some of the Technical Responsibilities

- * Design and implement the physical file structure.
- * Encode and test the programs.
- * Document the programs and the interfaces between modules.
- * Deliver and install the product.

3.3 THE RESULT

To make an already too long story short, the product that resulted had very little resemblence to what the users were expecting. Data was redefined, screens were changed beyond recognition, and functions were eliminated. By implementation date, the programs were untested and were full of software bugs. An attempt was made by the user community to try to salvage the programs and to try to use them. In a matter of days, a 124-page report was prepared for management recommending a "no-go" decision for implementation. Needless to say, that after almost two years and nearly twenty thousand dollars, no one was pleased.

4. AN EVALUATION

It is felt that this case can illustrate several problems which would warrant the attention of any institution or individuals attempting a similar endeavor. Following are some answers to some self-asked questions and comments which may be enlightening.

USER CONTRIBUTIONS IGNORED

It appeared that the user contributions were ignored by the technical community. Perhaps the technical community felt that their area of expertise had been encroached upon. The users were very involved and did perform analysis tasks that the programmers historically did themselves. Some programmers argued that since the data displays are the only visible sign of their work, they should be the ones who actually design them. Others felt that the programmers should be allowed to collect the data for the needs analysis themselves by actually being in contact with the clerical staff of the application area. It was claimed that the users were not capable of doing the tasks that they were doing. All in all, the author feels that these are problems resulting from the attempt to convert the traditional "architects" to "contractors."

OPERATIONAL SYSTEMS VS MIS

There was a difference in the point of view as to what the project was to produce between the parties involved. It appeared that the programming staff concentrated on meeting the operational needs of the application, whereas the users were more concerned with the management needs. It is possible that the user articulation of management needs didn't seem relevant to the application *per se* and, as a result, were overlooked.

WEAK ORGANIZATION

The organization was weak. The two groups of user and technical had no effective mechanism for problem resolution between them. There was no coordination of project effort between the two groups. Responsibility for the project overall was not fixed.

SOFT BUDGET

The monies allocated to the project could, at best, be called soft. Since the funding was not very secure and since management felt reluctant to formalize the organization, the project didn't have the organizational strength to reflect its institutional priority. The staffing provided by the new monies was temporary because of the inability to provide commitment beyond a few months at a time.

COMMUNICATION BREAKDOWN

Communication failed. Computer center management felt that too much time was spent in "red tape" and ordered the doors shut and told the programmers to "go with what they had." One should note that this was in effect, an abandonment of the agreed upon project methodology that was to be used.

POOR PROJECT CONTROL

There was ineffective project control. In a review with higher management, the DP managers claimed that they "lost control" of the project and claimed that they were surprized by the result. They actually agreed with the users on a "no-go" decision.

OBSTACLES

There were internal and external obstacles to both the user and technical communities. Some user management proved to be a bottleneck. There was over concern with the political aspects of SDMS rather than moving to get the job done as efficiently as possible. As a result, pieces were formed too late and key people were not involved early enough. In the technical area, the management in charge very probably felt that the project had very little institutional priority and therefore payed very little attention to the problems at hand. Other managers were more concerned with the personal payoffs of the project than for the institutional benefit.

PERSONALITIES

Personalities impacted the result. Computer center management placed the cause of some problems upon some programmers, claiming there was malicious and ill intent.

LACK OF EXPERIENCE

There was an absence of adequate expertise. The project was laden with rookies. This was the first full-size application to be undertaken utilizing a data base approach. In the programming area, many of the software tools were new to the institution. The staff expertise with these tools was low. The chief programmer, as almost all others, were programming their first application in the computer language chosen (PL/I) or their first application at all. The interaction of user and technical persons at this level was unprecedented at USD, so no past experience with its success was known. It was clearly a first-time effort for all of those involved.

LACK OF COMMITMENT

Commitment to the project was not equally shared. The President approved the project and stated it as an institutional objective. The users supplied staff and resouces via re-allocations. The technical area withdrew its staff and some facilities midway into the project.

5. SUMMARY

Future systems development will require more management analysis and more user involvement. This will effect the way computers are made[6] and the way new systems are developed.

Persons on the cutting edge of this frontier should be prepared for what could be a difficult challenge. It is very likely that changes in the way information is handled within an organization will effect both its political and power structures.

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[6] Lecht [1977:96]

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REGISTRATION EFFICIENCY USING ON-LINE OPTICAL SCANNING EQUIPMENT

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Due to inflation, the cost of operating colleges and universities is increasing rapidly. Yet, most colleges are faced with declining enrollments and associated budget cuts. Optical scanning is one solution for reducing a university's costs. On-line optical scanning equipment permits registration of students at Georgia State University (GSU) in less than ten minutes. Only two Opscan 17 machines, two printing terminals, three video terminals, and two full-time staff are needed to register GSU's 20,000 students each quarter. The same simple form, procedure, and system are used for Early Registration, Regular Registration, Late Registration, and Drop/Add. The system is completely computerized. Students obtain immediate results, and planning information is readily available to University administrators for prompt decision-making purposes.

REGISTRATION EFFICIENCY USING ON-LINE OPTICAL SCANNING EQUIPMENT

Registration can be made more efficient and less expensive using optical scanning techniques. Today efficiency is very important to colleges and universities which are faced with rising operating costs and declining enrollments. Efficiency (in terms of personnel and equipment) and better service to students should be major considerations in "Planning Higher Education Information Systems for the 1980's."

Registration is one of the most visible administrative functions at colleges and universities which routinely affects students, faculty, administrators, and staff. This universal function also has its common set of problems. In recent years there has been a trend in the use of on-line computer systems for registration. However, many of these on-line systems are used only for pre-registration, and the traditional arena-style system is still used for regular and late registration. Most on-line registration systems use video terminals to enter schedule requests. Another approach is to use optical scanning terminals.

If you consider the merits of optical scanning versus video terminals for registration, it can be easily established that compared to optical scanning equipment, more video terminals would be needed, which would require more lines to the computer and more staff to operate the terminals. When using optical scanning, the student prepares the input by coding a machine-readable form. This means that it is not necessary to hire operators to key in schedule requests. An optical scanning machine can read the form prepared by the student much faster than an operator could key in the same schedule.

Georgia State University (GSU) uses a completely on-line optical scanning based registration system. The system was first implemented in the Summer Quarter of 1975. The phrase "completely on-line" means that all functions of registration are completely computerized. This includes early registration, regular registration, late registration, and drop/adds.

From the student's point of view, registration at GSU is generally simple and usually quick. The student fills out and codes an optical scanning form and then while he or she waits, a three-part Class Schedule and Invoice form is printed. The student then pays his fees completing the registration process. Basically, the same procedure and the same form are used for all phases of registration. Thus, the process is greatly simplified.

The appendices to this paper include copies of GSU's Registration form, Class Schedule and Invoice form, Appointment Notice, and Special Requirements form. Additionally, a one-page summary of many of the registration system's characteristics is included. The remainder of this paper is divided into eleven major sections, which are:

1. Description of the Registration System
2. Drop/Add and Late Registration Procedures
3. Student and Equipment Problems
4. Additional System Information
5. Special System Features
6. Background of Development and Things Learned
7. Disadvantages of the GSU System

8. About GSU
9. Equipment and Technical Information
10. Considerations for Using System Elsewhere
11. Summary

Description of the Registration System

In this section we will be discussing:

1. The Registration Calendar
2. The Quarterly Schedule of Classes Bulletin
3. The Registration Permit and Appointment Notice
4. Advisement Procedures
5. The Steps of Registration, and
6. Payment of Fees

Registration is comprised of three phases totaling fourteen days per quarter. Phase I (Early or Pre-Registration) is held for approximately eight days prior to the last week of the quarter. Phase II (Regular Registration) is the three working days immediately preceding the beginning of classes. Late Registration occurs during the first three days of classes.

A Schedule of Classes Bulletin is printed each quarter containing the courses offered for that quarter. (See Appendix C) The bulletins are available to students approximately three days prior to Phase I. From these bulletins students obtain the course information and "computer numbers" necessary to register. The computer number is a key element in the optical scanning based system and is the "call number" which the student codes on the optical scanning form to request a particular course.

A "Registration Permit and Appointment Notice" is mailed to each student prior to registration. (See Appendix A) Appointments for registration are scheduled at half-hour intervals. If the student's scheduled appointment presents a problem, the appointment can be changed, although the revised appointment must be at a later date and/or time.

Once the student has received the Registration Permit and Appointment Notice he can make arrangements for advisement according to the instructions from his academic college. Brief advisement instructions for each academic unit are printed on the back of the appointment notice. Most colleges at GSU do not require advisement. However, advisement is available to all students who desire it. If advisement is required by the college, the student must obtain the advisor's signature on the Registration Permit and Appointment Notice before the student is permitted to register.

Most students come to the registration Reception Area approximately fifteen minutes prior to the time of their appointment. This gives the student an opportunity to fill out and code the Registration Course Request form prior to entering the main Registration Area. (See Appendix B) Since the registration form provides for coding only four courses, multiple forms may be submitted if necessary. Students are encouraged to consult the Available Course List posted in the Reception Area before filling out their form. Doing so will help the student avoid a problem schedule which might otherwise result from requesting a full or discontinued course section. These Available Course Lists are updated within fifteen minutes after a course is filled or discontinued.

Upon entering the Registration Area the student's Registration Permit and Appointment Notice is taken up and the time and date are verified.

The student then submits his course request form by inserting it in one of five slots. Two of these slots are for multiple registration forms and/or registration forms with attachments. Attachments include scannable Overflows, Course Authorizations, and Registration Hold Waivers, and a nonscannable Course Overload form.

After the student submits his registration form, he has a seat and waits for the form to be processed. Over 80% of students receive their results in less than ten minutes. A registration worker gathers up the forms and quickly checks them for possible damage. All forms are turned the same way to insure proper reading. The forms are placed in one of the Opscan 17 machines, which are used to scan the information coded on the form. The scanned information is transmitted via telephone lines to the University's Computer Center where a Univac 90/80 computer is used to analyze the students' course requests. The computer checks many things, including student eligibility, registration holds, course availability, and so forth. In an average time of less than five seconds, the results are sent back through the telephone lines to the Registration Area.

Either a three-part Class Schedule and Invoice form (See Appendix C) or a one-part Problem card is produced as soon as the computer processes a registration form. The student's name is announced over a loud speaker system, at which time the student picks up his results. The student then leaves the Area if he has received a satisfactory schedule. Otherwise, he may remain in the Area and submit another course request form in order to obtain a satisfactory schedule.

Students who encounter problems may obtain assistance from the staff located in the Registration Area. A student may also obtain a

"Registration in Progress" pass if it becomes necessary to leave the Registration Area to resolve a problem. This pass permits the student to reenter the Registration Area without having to get another registration appointment.

Fees are paid at the Student Accounts Office in another location on campus. Fees may be paid immediately or at some later time prior to the Fee Deadline. When fees are paid, all copies of the Class Schedule and Invoice form are given to Student Accounts. The first copy is scanned by an Opscan machine located in Student Accounts to tell the computer that the student has paid his fees. The second copy is Student Accounts' copy. The last copy is stamped and given back to the student. This copy serves as a temporary I.D.

The Fee Deadline is always on the last day prior to the beginning of classes. Students who do not pay by the Fee Deadline will have their Class Schedules cancelled and will have to late register (and pay a late fee) if they wish to attend that quarter. Courses from cancelled schedules are placed back into the available course inventory for students who are late registering or drop/adding.

From the student's point of view the registration procedure consists of submitting the form, obtaining results, paying fees, and leaving. That's it! The entire registration process should require less than fifteen minutes of the student's time.

Drop/Add and Late Registration Procedures

The same simple registration form and essentially the same procedures are used for all phases of registration. This includes Late Registration and Drop/Add.

There is no special day set aside at GSU to drop/add. Students who wish to drop/add may do so anytime after they have registered. All that is necessary is to obtain a new appointment from the Appointment Office. A student merely indicates "drop" or "add" for each course he enters on the registration form. After drop/adding, a student receives a revised schedule. The new schedule includes courses kept from his earlier schedule and courses added, followed by a dotted line and any courses that were dropped. All revised Class Schedule and Invoice forms must be taken to Student Accounts, even though the transactions may have resulted in an "even swap" with no money due. Otherwise, the student will appear as a problem on the class roll.

The Late Registration procedure is essentially the same. The same registration form is used and the process is completely computerized. The only difference is that no appointment is required. Late Registration begins with the first day of classes. Activity during this phase consists mostly of drop/adds. Since no appointment is required, there is usually a line on the morning of the first day. At GSU a late fee is charged for those students who late register. The late fee is normally waived for new students who have just been accepted by the University.

Student and Equipment Problems

The topics of this section include:

1. Problems due to a student's circumstances
2. Problems related to courses
3. Problems related to miscoding of forms
4. Assistance available to students in the Registration Area, and
5. Computer problems

Students who encounter problems in the registration process may remain in the Area and resolve the problem before leaving. There are a variety of problems which the student may encounter due to his circumstances. These include:

1. A hold may be placed on the student's record by offices such as Student Accounts, the Library, and so forth. In such cases, the student must obtain a Hold Waiver form from the office that placed the hold before he will be permitted to register.
2. A student may attempt to register for more than the normal load of hours (18 for undergraduate and 15 for graduate students). A student who wishes to register for more than the normal course load must obtain an Overload Approval form from the Dean's Office of the college in which he is enrolled. Otherwise, the student must reduce the number of hours for which he wishes to register and resubmit his registration form.
3. A student may receive a problem schedule indicating that he is "not on file" or "ineligible." Not on file problems usually

result from the student miscoding his social security number. However, both not on file and ineligible problems can result from a student attempting to register inappropriately or from communication problems between the various offices involved. In most cases the students who are eligible have been given documentation from the office that accepted them, which can be presented in the Registration Area to clear up such problems.

Most registration problems are related to courses and are due to "full" courses. In this case the student must choose another course or obtain an Overflow form from the college or department teaching the course. Other course problems include:

1. Discontinued Courses -- Student must select another course.
2. Invalid Hours -- Student failed to code the number of hours for a variable-hour course.
3. Unauthorized -- Student attempted to register for a course that requires special authorization which he did not obtain. The solution is to obtain authorization from the college or department teaching the course.
4. Not Graduate -- An undergraduate student attempted to register for a graduate course. In most cases an undergraduate student cannot register for graduate courses.
5. Invalid Drop -- Student attempted to drop a course for which he is not registered.

In coding forms students make less than a 2% error. The rate of coding errors has been greatly reduced since the system was implemented. Then it was approximately 8%. Miscoded forms usually result in the student obtaining a Problem form indicating "Not on File" or "Invalid Computer Number." Students realize miscoded forms cause them a delay and they will have to submit another form. This is an incentive which has greatly reduced coding mistakes. The simple form design also helps to reduce the rate of errors.

During Phase I there is a Registration Consultant from the Office of the Registrar in the Registration Area to assist students who encounter problems or need assistance. During Phase II and Late Registration there are representatives from each of the academic units in the Area to provide assistance. Academic representatives are in the Area during Phase II and Late Registration since this is when most new students register and when many courses have closed.

If the computer goes down anytime during registration, the student is given one of two options, with a third option available during Phase I. If the downtime is relatively short, the students are informed of the problem and asked to wait until the computer is up again. If the downtime exceeds 45 minutes, students may wait or may leave their forms for processing and pick up their results later. During Phase I, students may leave their forms for processing and request that their results be mailed to them. The disadvantage to this option is that the student would have to make a subsequent trip to the University to resolve problems if they occur. If the computer is going to be down for a long period of time, the Manual Backup Registration System must be used.

The Manual Backup Registration System is essentially the same system the University used before implementing the on-line computer system. There are several major considerations in using a manual backup system, which include:

1. The problem of converting from a computer system to a manual system -- The major problem is the amount of time necessary to convert and having up-to-date counts of students for each course section.
2. Operating the manual registration system -- This requires mobilizing additional staff, setting up the manual registration area, and distributing the materials necessary for manual registration.
3. Converting back to the computer -- Once the computer is up again it is necessary to update the on-line system with the activity from manual registrations before the on-line system can be used again.

Obviously one of the biggest problems with the manual backup system is that the same level of service cannot be performed as is possible with the computer.

Additional System Information

Some additional information about GSU's completely computerized on-line registration system should be helpful. This section will cover:

1. The Volume of Activity
2. The Importance of the Registration Permit and Appointment Notice
3. Course Authorization
4. Overflows into Full Sections
5. Registration Hold Waiver Forms

6. Handling of Overloads, and

7. Personnel, Equipment, and Facility Resource Requirements

Approximately 82% of GSU students register during Phase I, 14% register during Phase II, and 4% during Late Registration. In a typical quarter there are eight days of registration for Phase I, three days for Phase II, and three days for Late Registration. As would be expected, most drop/adds occur during Late Registration. Approximately 4,000 students drop/add at least one time each quarter.

The volume of transactions for each registration is fairly consistent for similar quarters. Approximately 30,000 optical scanning registration forms are used to register students, resolve problems, and process drop/adds. Some 25,000 Class Schedule and Invoice forms are printed. Nearly 2,500 problem forms are printed each quarter. Some 10,000 Special Requirements forms are processed for Course Authorizations, Overflows, and Hold Waivers. The approximately 4,000 students who drop/add each quarter results in some 10,000 transactions.

The key to the successful control of the flow through the Registration Area at GSU is the appointment scheduling algorithm. Priority is based on hours earned towards graduation. At GSU, it has been found that a half hour between appointments is best. This interval seems to prevent students from coming to the Registration Area too soon and provides the best flow of students through the area. No one is permitted in the Registration Area until the exact time of their appointment. If a student should enter the Registration Area before his appointment time and submit a form or have another student register for him, the computer will reject the form. If a student does not make his scheduled appointment, he can register from 4:30-6:00 p.m. that day during the open period or he can obtain an appointment for a later date and/or time.

Registration appointments are mailed to the students twice a quarter. The first mailing is approximately two weeks prior to Phase I. The second mailing is approximately one week prior to Phase II. Appointments are mailed to all eligible students. Eligible students include those students who are currently enrolled, students who have attended within the past three quarters, newly-accepted students, and cleared reentering students. The second mailing of appointments (for Phase II) is to those students who did not early register, newly-accepted students, and reentering students cleared since the first mailing. Obviously the first mailing is the largest. Both batches are sent bulk-rate in order to save postage expense. The appointments are distributed using the postal system to prevent students from having to stand in line to pick them up. The Registration Permit and Appointment Notice serves several very important functions, which include controlling advisement, communicating registration dates and times to the students, and providing information regarding advisement.

An optical scanning "Special Requirements" form is used for overflows, course authorizations, and waiver of registration holds. Ten overflow optical scanning forms (which permit students to register for full courses) are printed for each section offered. A batch of Special Requirements forms is printed for each course section that requires authorization. The number of forms printed depends on the class size. A batch of registration hold waiver Special Requirements forms are printed for each of the thirteen offices that can place a hold on a student's record.

Prior to registration each quarter these forms are given to the colleges and departments for distribution to students. Students who need one of these forms must obtain it prior to registering and attach it to their registration form. Students who wish to enroll for more hours than the normal course load may obtain an Overload form. This form is not scannable.

GSU's registration system is very efficient in terms of personnel and equipment. The equipment necessary to register students consists of only six terminals. This includes one Opscan 17, two printing terminals, two TI 745's, and one video terminal. However, more equipment is available for backup purposes and to assist in advisement.

Personnel required to operate the Registration Area include one Registration Coordinator, six Student Assistants, and one Registration Consultant. During Phase II and Late Registration there are approximately nine college representatives in the Area to assist students. Additionally, six Student Assistants are used to operate the Appointment Office.

The Registration Area consists of approximately 6,000 square feet. All functions, including the Reception Area, are in the Registration Area, except for the Appointment Office.

Special System Features

GSU's registration system has many special features which include:

1. Section Rollover
2. Appointment Checking
3. No Drop/Add Day
4. System Simplicity
5. Virtually Unlimited Flexibility

6. Effective Data Management, and
7. Fee Computation and Class Schedule Controls

GSU, like many colleges, has several classes of the same course which are taught on the same day and at the same time. These are referred to as sections. Regardless of which section a student requests, GSU's on-line system will give the student the first available section. This process is referred to as "section rollover" and prevents many problems for students. The section rollover feature can be suppressed by the department offering the course.

The Registration Permit and Appointment Notice controls eligibility and entrance into the Registration Area. The system checks a student's eligibility and appointment time as a safeguard. This check is performed by the computer at the time the student submits a course request form. The computer will reject the student's registration form if the student is not eligible or if the student is attempting to register prior to his registration appointment. This effectively catches students who slip into the area or have students with an earlier appointment register for them.

GSU has no special day set aside for drop/adds. At GSU students may drop/add at any time after they have registered. By incorporating drop/adds into the normal registration process, a very difficult and unpleasant function was eliminated and better service was provided to the students.

One of the most outstanding features of this system is its simplicity. It is simple because the same procedure and form is used for all phases of registration, including Drop/Add and Late Registration. Additionally, the form and the procedure are simple.

The system is extremely flexible and has avoided the rigidity normally associated with many computer systems. Registrar personnel can override the computer in any matter whatsoever. This includes adding students to the system, making students eligible, adding course sections, changing the limits for course sections, etc. The academic advisors located in the Registration Area during Phase I and Late Registration can overflow students into full courses, authorize students to take courses, and so forth.

Fees are calculated by the computer which takes into consideration whether the student is a resident, handles late registration fees, and so forth. When a Class Schedule and Invoice form is printed, the social security number of the student is coded by "slugging" in the appropriate area on the form. Thus, the terminal-printed form becomes a "turnaround document" and is machine readable. Once the student pays his fees, or in the case of Financial Aid confirms his fees, the top copy is read by an Opscan machine to confirm the student's schedule.

From a systems point of view, one of the better aspects of the system is its data management facility. The student prepares the input and is responsible for the accuracy of the data. The registration master file is updated with the student's course request, and from this data the scheduling algorithm analyzes the student's request and produces either a class schedule or a problem form. This is significant since the data is in the computer at the time the output is printed. This means that registration data is always accurately recorded in the computer and is immediately available to produce class counts, enrollment statistics, and so forth. Therefore, many of the problems with data accuracy and timeliness of updating are eliminated.

Background of Development and Things Learned

Obviously, many things were learned by GSU in developing its on-line registration system. In this section we will discuss:

1. Systems Previously Used by the University
2. Objectives When the System Was Implemented
3. Operational Changes Necessary in the Implementation of the System
4. Appointment Scheduling Algorithm
5. Forms Design Considerations
6. Determination of Equipment Needs
7. Production Efficiency, and
8. Miscellaneous Items

GSU, like many institutions, used the traditional arena-style method of registration for years. When it was finally decided that it was no longer desirable to use the arena-style system, the registration process underwent several changes. The system currently used by the University is actually the result of an evolutionary process, in which several systems were used along the way.

The break from the traditional arena-style system of registration began in 1971. The first step was the revision of Early Registration procedures. An optical scanning based batch system was used, in which the students submitted their course request forms by a certain date. These forms were fed into a scheduling program and the resulting schedules were mailed to the students. The process required about six weeks.

This system was used for over four years but it had several drawbacks. Six weeks was considered excessive to process the forms and get the results to the students, and the arena-style method still had to be used for Regular Registration and Drop/Add Day. There were problems with the postal system and approximately 15% of the students received problem schedules, which required subsequent action by the student.

The next step was the elimination of the class cards used in the arena-style registration system. A class size control register (a type of tally sheet) replaced the class cards. The tally sheet was implemented to get people away from the notion of using cards. Students would record their schedules on an opscan form to facilitate updating of the computer. Two things were accomplished: a) both Early Registration and Regular Registration used optical scanning forms, and b) the cards were eliminated. This system was successfully used for approximately two years. During the same period of time, a problem resolution day was implemented for Early Registration in which an on-line system was used to resolve schedule problems. This provided several important advantages in that it increased the number of students who successfully completed Early Registration and proved that an on-line system could be effectively used.

Finally, in 1975, a completely on-line registration system was implemented. It was always realized that the possibility of computer failure posed the biggest threat to the successful implementation of the system. Registration was initially held from 8:30 a.m. until 8:00 p.m. and was spread out over six weeks. Gradually the amount of time required for registration was reduced to the present three weeks.

The Registration Area is now open from 9:30 a.m. until 6:00 p.m.

The most elementary objective of any registration system is to record the students who have registered, along with their courses, while controlling class size. GSU's further objective was to register students quickly and simply while avoiding long lines and minimizing problems. Due to budgeting limitations, only a minimum of personnel and equipment could be used. This dictated that whatever system was developed had to be efficient and production-oriented. The following major objectives were defined:

1. One Trip to Complete Registration -- This was to minimize the time required for a student to complete registration and was to include all procedures associated with registration, such as advisement, registration, resolution of any problems, and payment of fees.
2. Elimination of Long Lines -- Both the administrators and the students seemed to share negative attitudes toward long lines. Thus many steps were taken in the design of the system to eliminate long lines, and equally important, to eliminate the number of lines.
3. Elimination of Drop/Add Day -- The trauma traditionally associated with this process was eliminated by permitting students to drop/add any time after they had registered.
4. Accuracy of Data -- Because of the volume of data resulting from registration this had always been a major problem, and even a small percentage error rate still resulted in a lot of inaccurate data.

5. Timely Availability of Registration Data -- In addition to accuracy, it was desirable to have up-to-date information readily available for decision-making purposes and to facilitate regular University operation.
6. Equipment and Personnel Efficiency -- In terms of these resources the system had to be efficient due to budgetary limitations.

The objectives developed prior to designing the on-line registration system resulted in the dramatic change of nearly every function associated with registration. There were far-reaching implications. Procedures and policies were changed, forms redesigned, new programs written, and the students and staff had to be reeducated. An almost philosophically-based approach in the design of the system was required since there were no models available which would accomplish the desired objectives. This necessitated innovative thinking that produced a number of new underlying concepts on which the system is now based.

To accomplish the desired objectives, the following changes were made and concepts were adopted:

1. Reentry applications for those students who had been out for three quarters or less were discontinued. Students who had attended during the previous three quarters were automatically permitted to register during any phase of registration.
2. The traditional drop/add day was eliminated and students were permitted to drop any time after they had registered.
3. All functions not directly associated with registration were eliminated or separated from the Registration Area.

Often registration has been plagued with many different functions since this was the time each quarter when there was a captive audience. It took a lot of persuasion, but it was decided that only primary registration functions would be allowed in the area. Registration was considered the main event and all other functions not directly related to registration were recognized as hindering the expeditious registration of students.

4. Data input for the computer was prepared by the students. Due to budgetary limitations there was not enough money to obtain the many video terminals and operators necessary to use the traditional updating method. Therefore, optical scanning was chosen because it offered a more economical way to enter the requests into the computer. Also it was reasoned that if the input was wrong, the student shared the responsibility and there would be a natural incentive for the student to minimize the errors.
5. Every effort was made to register as many students as possible well in advance of the beginning of classes. This new concept was considered extremely important and had many implications. It was reasoned that attempting to register a large volume of students on the day before classes started would present a potentially disastrous situation if major computer problems occurred.
6. The number of students who could register per time period was carefully controlled. It was considered very important to have

a predicatable, steady volume of students registering, thereby avoiding peaks and valleys which might overload the system. Thus it was decided to operate at well below equipment capacity to insure "catch-up" capability in case of unforeseen difficulties.

7. The entire registration procedure was deliberately simplified. Previously, students used different sets of forms and different procedures depending on when they registered. GSU thought that it was very important to have only one procedure and one registration form regardless of when a student registered.
8. The fee payment deadline was delayed until the day before classes began. This was another extremely important concept. It was implemented as an incentive to encourage students to early register in order to reduce the volume of students registering during Phase II. The deadline is always on the day before the beginning of classes.
9. An Appointment Office was set up to permit students to change preassigned appointments that presented a problem and to issue appointments for drop/adds.
10. Registration was to be managed and operated using a minimum of personnel. GSU's registration staff consists of one full-time Registration Coordinator and two half-time Assistants. During Registration twelve part-time Student Assistants are hired. Six are used to run the Registration Area and six are used to operate the Appointment Office.

Since the system had to be efficient this meant using a production-line approach. This implied four things:

1. The flow of students through the Registration Area must be carefully regulated.
2. Registration Course Request forms must be quickly obtained from the students.
3. The registration forms must be quickly processed.
4. Results must be quickly distributed to the students.

The appointment scheduling algorithm became extremely important in controlling the flow of students through the area. A descending number of appointments are scheduled for each time period. With each day of registration more courses are closed, making it increasingly difficult for students to register without problems. Since students are permitted to change their appointment to a later date and/or time and because they can drop/add after having registered, there is a shift of students into the later time periods.

Two important rules were established. Appointments are good for one half hour only, and a changed appointment must be at a later date and/or time. Since appointments are based on priority and changes must be to a later date and/or time, there is less incentive for changing appointments, except in necessary cases. Later, an open period was established in order to provide a time each day when students could register if they could not make their primary appointment. The open period is from 4:30 - 6:00 p.m.

When the system was first implemented, forms were simply handed to registration workers, who placed them in the machines.

It was quickly discovered that students frequently wanted to discuss a problem with one of the registration workers and this held up the process for everyone. Therefore, a slot board was implemented in order to quickly obtain the Course Request Forms from the students. This proved to be an extremely important change.

It was also soon learned that when schedules were being distributed to the students, the students would rush to the table where names were being called. It became obvious that this hindered distribution of results. Therefore, two tables, one red and one blue, are used. There is a microphone at each table. A batch of names is called at one table and while students are picking up forms at that table, another batch of names is called at the other table. By switching back and forth between the tables, the congestion is considerably alleviated.

It was quickly discovered that equipment never seems to operate at its theoretical limit. Equipment breaks down, and even with careful scheduling there seems to be some peaks and valleys. Therefore, it was learned that more equipment should be purchased than is actually needed for things to run smoothly. Having additional equipment means that there is immediate replacement in case of equipment failure. Also, additional equipment is immediately available to provide additional processing capability in the event of unexpected peaks and catch-up following computer downtime. CSU currently runs at approximately 30% of the rated capacity of its equipment. This has also proven to be extremely important to the successful operation of the on-line registration system.

Many little things were learned which together have a significant impact on the success of an on-line registration system.

One of these was having phones in the area so that students can resolve problems without having to leave the area. It was also discovered that a smaller form has a psychological advantage over a larger one. It was found that instructions should be as simple as possible and that the number of instructions should be minimized. The same is true for signs in the area. It seems that the more signs or the more instructions you have the more confusing it is, and besides, it was found that most students do not really read them.

Disadvantages of the GSU System

The description thus far has considered the positive aspects of the registration system. Of course some problems do exist, but these are minimal compared to many other types of registration systems. The most frequent problems experienced include full courses, miscoded forms, and failure to obtain course authorizations. From the Registrar's point of view, the primary problem is that of computer failure. The major problem for the Student Accounts Office is that approximately 5,000 to 6,000 students wait until the Fee Deadline to pay their fees. This results in long lines at the cashier windows.

Every system has some disadvantages and the registration system at GSU is no exception, although the problems appear to be minimal compared to other previous methods of registration. The following are, in the author's opinion, the most important disadvantages of GSU's on-line registration system:

1. The system's vulnerability due to computer downtime or equipment failure.

2. The system tends to increase the volume of drop/adds.
3. The delayed fee payment deadline results in too many students waiting until the last day to pay their fees.
4. The on-line system requires more days than the manual system.
5. The expectation of students as to how long it will take to register cannot always be met due to computer problems and full courses.
6. There is a definite limit as to the number of students that can be registered in one day, in one area, regardless of the amount of equipment and staff available.

Of all problems encountered, the most significant is the system's susceptability to computer downtime. Without the computer, students cannot be registered unless the manual backup system is used. Normally when the computer is down, it can be repaired in a short period of time. The wait is usually no longer than thirty minutes, although longer downtime has occurred. Even with computer difficulties, over 80% of GSU students still register in less than ten minutes. Approximately 75% of the students obtain the schedule they want the very first time they submit a Course Request form.

About GSU

At this point it should be helpful to know more about GSU and the environment in which the system is used. GSU is a commuters' college and has no dorms. Most students live within a 20-mile radius of the University. Approximately 75% of GSU students work (most full-time) which probably accounts for why 46% of the student body is enrolled in night classes. The average age is 27. Females represent over 54% of the enrollment.

GSU has the largest enrollment of graduate students in the southeast, which is approximately 7,000 per quarter. Over 20,000 students enroll each quarter. However, some 33,000 different students annually attend the University. In addition, the Division of Public Service offered over 1,000 continuing education programs with the number of participants estimated at 60,000 this past year.

In the past ten years enrollment has increased from 15,097, Fall Quarter 1970 to the current enrollment of 20,338, Fall Quarter 1979. This rapid growth created some operational problems which have been addressed in part by the completely computerized registration system.

The University is composed of eleven major buildings built or acquired at a cost of over $68 million. The University has six degree-granting colleges which offer over 42 degrees and 183 different majors. GSU is a very compact University with all the buildings located near to each other. Two large plazas join the buildings at GSU. This facilitates easy changing of classes, particularly for handicapped students. These plazas form the major part of the University campus and serve a very important safety function.

In addition to the registration system, GSU has gained widespread recognition for other systems development. Earlier this year the University sold its Degree Audit System software to Delaware County Community College in Media, Pennsylvania. The University has developed several other major systems, which include a user-based report generating system and a batch, data base management system using a concept known as Feedback. This system has been used to maintain a comprehensive data base of student and related information for over ten years. Currently GSU is implementing a completely on-line student record system, which when finished should be one of the most comprehensive on-line systems ever implemented anywhere. It will provide the ability to interface all offices that supply any type of applicant, student, and/or related data, such as curriculum information, high school profiles, and so forth.

Equipment and Technical Information

You may be interested in the equipment the University uses. GSU has two Univac 90/80 computers, which configure similarly. The Univac 90/80 computer is a time-sharing computer which can handle both interactive and batch jobs. One of the 90/80's has a main memory of three million bytes and the other has a main memory of two million bytes. Each computer has a virtual memory of 16 million bytes. The University has a total of 4.6 billion bytes of on-line storage. All programs are written in COBOL using VMOS, or Virtual Memory Operating System. A special subroutine known as CAM, or Communication Access Method, is used to connect multiple terminals to the same COBOL program. The programs are very efficient and require only 150 CPU seconds per day for the registration scheduling program.

A minimum of six terminals are needed to run GSU's on-line system. However, there are approximately 16 terminals actually in use. Three of these are Opscan 17's, eight are videos, and five are various types of printing terminals. Of these terminals, normally only one Opscan 17, one video, and three printing terminals are needed. The remaining ones are used by advisors to assist students, to provide backup should a primary terminal become inoperative, and to provide additional processing ability in the event of increased demand. In addition, there are two

TI 745's used to run and monitor the registration system.

The Opscan 17 is considered an optical mark reader and has communication ability. To the computer the Opscan 17 looks like a standard terminal. Operation is quite simple since the machine has only three buttons: on, off, and start. The rate of processing depends on the size of the form being scanned. Registration forms are scanned at approximately 300 per hour, per machine. Forms used to confirm fee payments are scanned at the rate of approximately 600 per hour, per machine.

Currently the GE terminet 300 and 1200 printing terminals are used for printing the Class Schedule and Invoice forms and Problem forms. These terminals were chosen because they contained certain features that GSU thought desirable. They are impact printers and have horizontal and vertical tabs, which greatly increases overall throughput. GSU has a GE model 320T printer on order, which promises to provide increased speed and reliability.

Considerations for Using System Elsewhere

A question that often comes up is, can other colleges use the same system? Of course this depends on many factors, but a general answer to this question is yes. To help answer this question more completely, this section will address:

1. Installation at Other Colleges
2. System and Program Design
3. Installation Considerations
4. Control of Volume by Phase, and
5. Availability of Software

Approximately twenty colleges and universities from all over the United States have visited GSU during the past two years to observe the system in actual operation. Additionally, GSU has received several written inquiries. The same system is being implemented at the University of Georgia in Athens.

GSU's registration system is actually a subsystem and is, therefore, not a part of the University's main Student Record System. All programs are written in modular form, which facilitates easy modification. Therefore, functions can be deleted, new ones added, or existing ones changed, as necessary. Input and output formats can easily be changed. Due to the design of the system, the data entry could even be made by video terminal as opposed to opscan if desirable. It is believed that the registration system software is simple enough to permit easy installation at any college or univeristy that has a modern computer within a matter of three months. This would include any changes necessary. This of course assumes there is available communication software that would permit several terminals to communicate with the same COBOL program.

The system contains all basic registration functions, such as checking eligibility, monitoring class size, and so forth, but may contain functions not desired by all colleges. Nor does it contain some functions that might be desired, such as computing quarterly dorm or parking fees and provisions for partial fee payment. It would be necessary for the user to write an interface program that would link its existing student data base to the system.

One of the key elements for any on-line registration system is computer reliability. It is absolutely essential to control the volume of registration by phase. The volume should be maximized during Phase I and minimized during Phase II. Computer downtime during Phase I is less critical, and there is no urgency since classes do not begin for several days. If significant computer failure should occur during Phase II (which is the most critical time), the volume should be low enough to provide emergency handling using a manual backup system. A delayed fee payment deadline immediately before classes begin is a powerful incentive to encourage students to early register.

GSU has invested a great deal of money and effort during the past few years in the development and refinement of this system. It is felt that the completely on-line optical scanning based registration system has widespread application in colleges and universities and could easily be supported by a variety of computer installations. Additionally it is felt that the system could be easily installed at other colleges for only a fraction of the cost that would be required for the college to develop its own system. Therefore, GSU has decided to make the registration system software available to colleges that may be interested.

Summary

Due to inflation, the cost of operating colleges and universities is increasing rapidly. Yet most colleges are faced with declining enrollments and associated budget cuts. Optical scanning is one solution for reducing a university's costs. On-line optical scanning equipment permits registration of students at Georgia State University (GSU) in less than 10 minutes. Only two Opscan 17 machines, two printing terminals, three video terminals, and two full-time staff members are needed to register GSU's 20,000 students each quarter. The same simple form, procedure, and system are used for Early Registration, Regular Registration, Late Registration, and Drop/Add. The registration system is completely computerized. Students obtain immediate results, and planning information is readily available to University administrators for prompt decision-making purposes.

The registration system at GSU consists of only four basic steps: the receipt of a registration appointment, submission of the filled-out optical scanning form, obtaining immediate schedule results, and payment of fees. In only one trip to the University the students can complete their registration, which includes advisement, registration, resolution of any problems, and payment of fees.

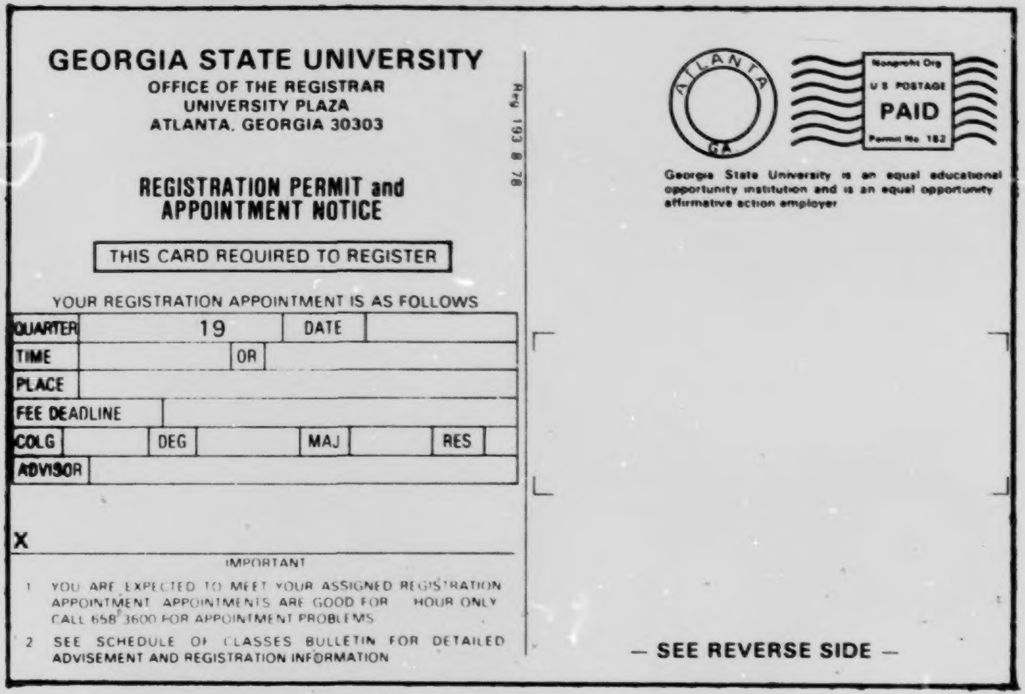
Two formal surveys were made of the students concerning the registration system when the system was first implemented. The overwhelming majority of the students surveyed preferred GSU's on-line registration system over any other system to which they were accustomed. This was considered significant since over 80% of GSU's students transfer from other colleges.

The completely on-line registration system implemented in 1975 at GSU has been much more satisfactory than any other registration method ever used by the University. Most people who hear about the system find it difficult to believe that it performs as well as described. Those who are interested are welcome to visit the University to observe the system in actual operation.

APPENDIX A

REGISTRATION PERMIT AND APPOINTMENT NOTICE

(FRONT)



GEORGIA STATE UNIVERSITY
OFFICE OF THE REGISTRAR
UNIVERSITY PLAZA
ATLANTA, GEORGIA 30303

Rev 193 8 78

REGISTRATION PERMIT and APPOINTMENT NOTICE

THIS CARD REQUIRED TO REGISTER

YOUR REGISTRATION APPOINTMENT IS AS FOLLOWS

QUARTER 19 DATE
TIME OR
PLACE
FEE DEADLINE
COLG DEG MAJ RES
ADVISOR

X

IMPORTANT

1 YOU ARE EXPECTED TO MEET YOUR ASSIGNED REGISTRATION APPOINTMENT APPOINTMENTS ARE GOOD FOR HOUR ONLY CALL 658 3600 FOR APPOINTMENT PROBLEMS

2 SEE SCHEDULE OF CLASSES BULLETIN FOR DETAILED ADVISEMENT AND REGISTRATION INFORMATION

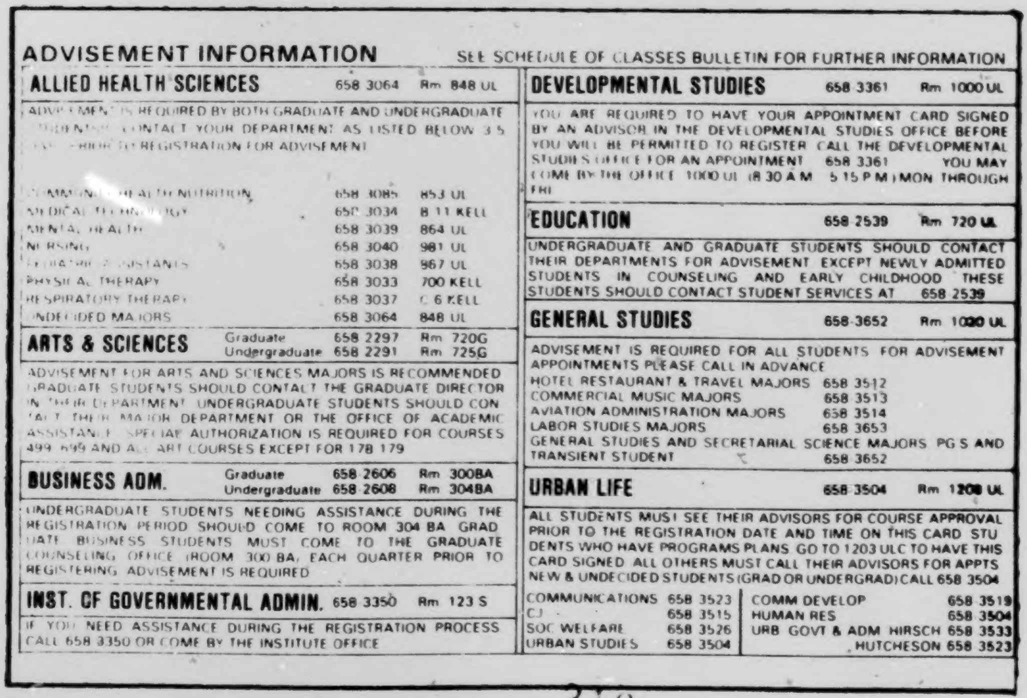
ATLANTA GA

Nonprofit Org
U S POSTAGE
PAID
Permit No 182

Georgia State University is an equal educational opportunity institution and is an equal opportunity affirmative action employer

— SEE REVERSE SIDE —

(BACK)



ADVISEMENT INFORMATION SEE SCHEDULE OF CLASSES BULLETIN FOR FURTHER INFORMATION

ALLIED HEALTH SCIENCES 658 3064 Rm 848 UL

ADVISEMENT IS REQUIRED BY BOTH GRADUATE AND UNDERGRADUATE STUDENTS CONTACT YOUR DEPARTMENT AS LISTED BELOW 3 5 DAYS PRIOR TO REGISTRATION FOR ADVISEMENT

COMMUNITY HEALTH NUTRITION	658 3085	853 UL
MEDICAL TECHNOLOGY	658 3034	B 11 KELL
MENTAL HEALTH	658 3039	864 UL
NURSING	658 3040	981 UL
PEDIATRIC ASSISTANTS	658 3038	967 UL
PHYSICAL THERAPY	658 3033	700 KELL
RESPIRATORY THERAPY	658 3037	C 6 KELL
UNDECIDED MAJORS	658 3064	848 UL

ARTS & SCIENCES Graduate 658 2297 Rm 720G
Undergraduate 658 2291 Rm 725G

ADVISEMENT FOR ARTS AND SCIENCES MAJORS IS RECOMMENDED GRADUATE STUDENTS SHOULD CONTACT THE GRADUATE DIRECTOR IN THEIR DEPARTMENT UNDERGRADUATE STUDENTS SHOULD CONTACT THEIR MAJOR DEPARTMENT OR THE OFFICE OF ACADEMIC ASSISTANCE SPECIAL AUTHORIZATION IS REQUIRED FOR COURSES 499 699 AND ALL ART COURSES EXCEPT FOR 178 179

BUSINESS ADM. Graduate 658 2606 Rm 300BA
Undergraduate 658 2608 Rm 304BA

UNDERGRADUATE STUDENTS NEEDING ASSISTANCE DURING THE REGISTRATION PERIOD SHOULD COME TO ROOM 304 BA GRADUATE BUSINESS STUDENTS MUST COME TO THE GRADUATE COUNSELING OFFICE (ROOM 300 BA) EACH QUARTER PRIOR TO REGISTERING ADVISEMENT IS REQUIRED

INST. OF GOVERNMENTAL ADMIN. 658 3350 Rm 123 S

IF YOU NEED ASSISTANCE DURING THE REGISTRATION PROCESS CALL 658 3350 OR COME BY THE INSTITUTE OFFICE

DEVELOPMENTAL STUDIES 658 3361 Rm 1000 UL

YOU ARE REQUIRED TO HAVE YOUR APPOINTMENT CARD SIGNED BY AN ADVISOR IN THE DEVELOPMENTAL STUDIES OFFICE BEFORE YOU WILL BE PERMITTED TO REGISTER CALL THE DEVELOPMENTAL STUDIES OFFICE FOR AN APPOINTMENT 658 3361 YOU MAY COME BY THE OFFICE 1000 UL (8 30 A M 5 15 P M) MON THROUGH FRI

EDUCATION 658 2539 Rm 720 UL

UNDERGRADUATE AND GRADUATE STUDENTS SHOULD CONTACT THEIR DEPARTMENTS FOR ADVISEMENT EXCEPT NEWLY ADMITTED STUDENTS IN COUNSELING AND EARLY CHILDHOOD THESE STUDENTS SHOULD CONTACT STUDENT SERVICES AT 658 2539

GENERAL STUDIES 658 3652 Rm 1000 UL

ADVISEMENT IS REQUIRED FOR ALL STUDENTS FOR ADVISEMENT APPOINTMENTS PLEASE CALL IN ADVANCE

HOTEL RESTAURANT & TRAVEL MAJORS	658 3512
COMMERCIAL MUSIC MAJORS	658 3513
AVIATION ADMINISTRATION MAJORS	658 3514
LABOR STUDIES MAJORS	658 3653
GENERAL STUDIES AND SECRETARIAL SCIENCE MAJORS PG S AND TRANSIENT STUDENT	658 3652

URBAN LIFE 658 3504 Rm 1200 UL

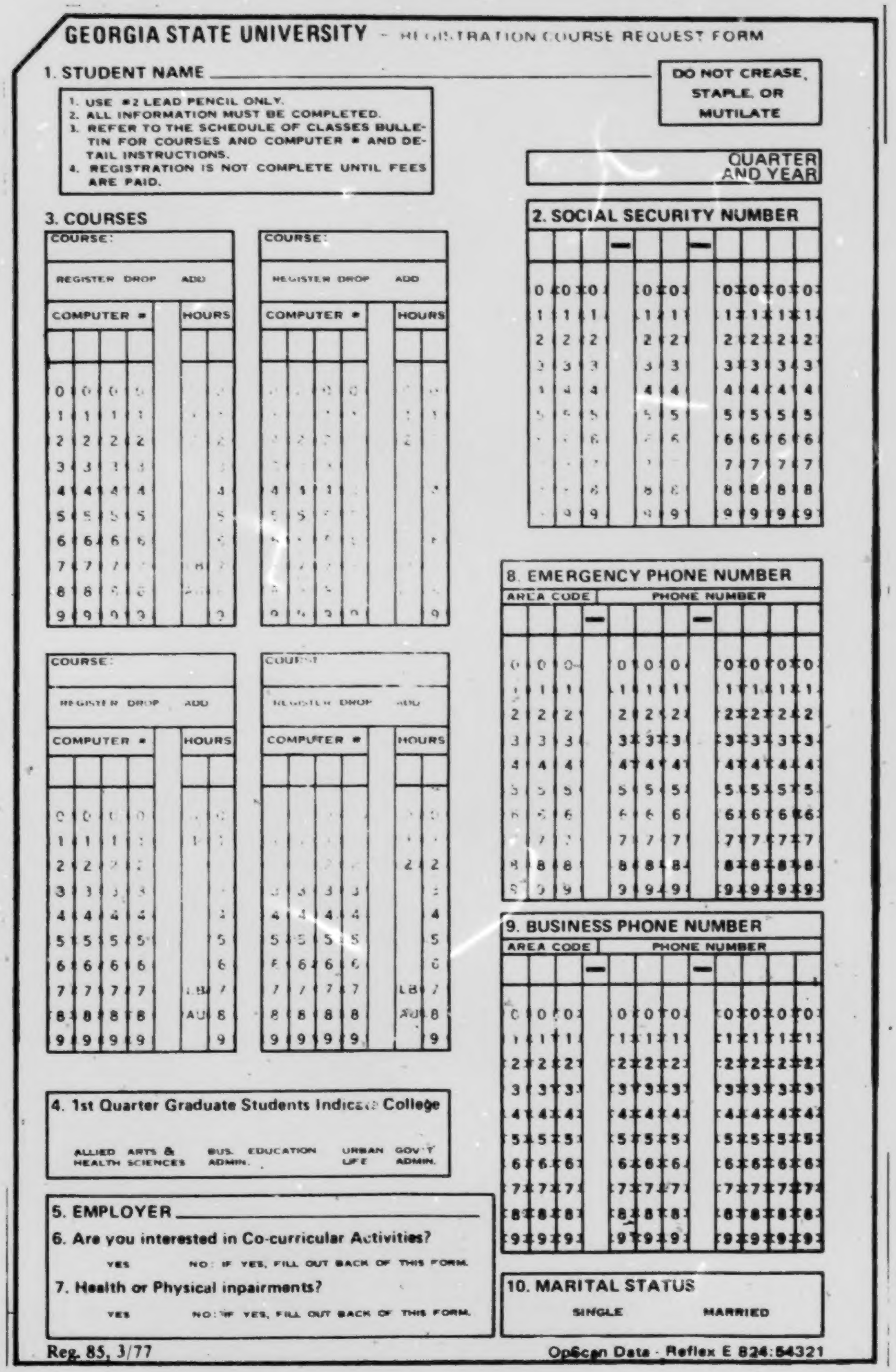
ALL STUDENTS MUST SEE THEIR ADVISORS FOR COURSE APPROVAL PRIOR TO THE REGISTRATION DATE AND TIME ON THIS CARD STUDENTS WHO HAVE PROGRAMS PLANS GO TO 1203 ULC TO HAVE THIS CARD SIGNED ALL OTHERS MUST CALL THEIR ADVISORS FOR APPTS NEW & UNDECIDED STUDENTS (GRAD OR UNDERGRAD) CALL 658 3504

COMMUNICATIONS	658 3523	COMM DEVELOP	658 3519
CJ	658 3515	HUMAN RES	658 3504
SOC WELFARE	658 3526	URB GOVT & ADM HIRSCH	658 3533
URBAN STUDIES	658 3504	HUTCHESON	658 3523

310

APPENDIX B

REGISTRATION COURSE REQUEST FORM



GEORGIA STATE UNIVERSITY – REGISTRATION COURSE REQUEST FORM

1. STUDENT NAME ______________________

DO NOT CREASE, STAPLE, OR MUTILATE

1. USE #2 LEAD PENCIL ONLY.
2. ALL INFORMATION MUST BE COMPLETED.
3. REFER TO THE SCHEDULE OF CLASSES BULLETIN FOR COURSES AND COMPUTER # AND DETAIL INSTRUCTIONS.
4. REGISTRATION IS NOT COMPLETE UNTIL FEES ARE PAID.

QUARTER AND YEAR

2. SOCIAL SECURITY NUMBER

3. COURSES

COURSE:

REGISTER DROP ADD

COMPUTER # HOURS

LB

AU

4. 1st Quarter Graduate Students Indicate College

ALLIED HEALTH ARTS & SCIENCES BUS. ADMIN. EDUCATION URBAN LIFE GOV'T ADMIN.

5. EMPLOYER ______________________

6. Are you interested in Co-curricular Activities?

YES NO: IF YES, FILL OUT BACK OF THIS FORM.

7. Health or Physical inpairments?

YES NO: IF YES, FILL OUT BACK OF THIS FORM.

8. EMERGENCY PHONE NUMBER

AREA CODE PHONE NUMBER

9. BUSINESS PHONE NUMBER

AREA CODE PHONE NUMBER

10. MARITAL STATUS

SINGLE MARRIED

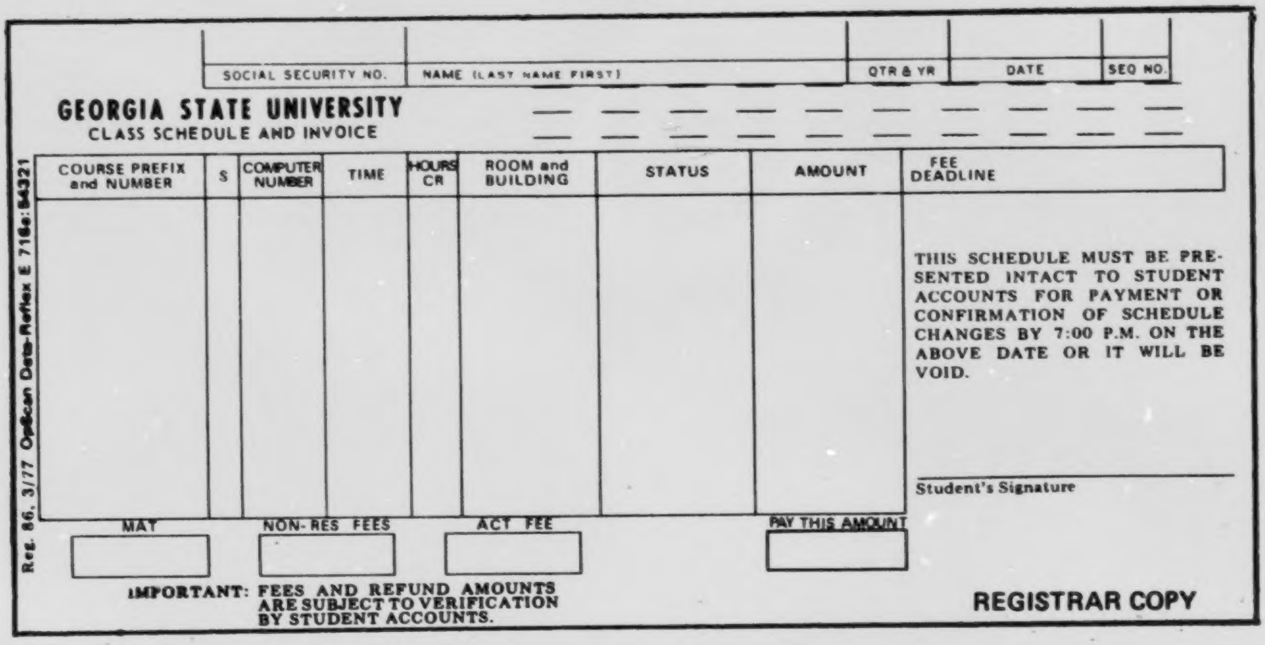
Reg. 85, 3/77

OpScan Data - Reflex E 824:64321

APPENDIX C

CLASS SCHEDULE AND INVOICE FORM

(1st Copy of 3)



SOCIAL SECURITY NO.	NAME (LAST NAME FIRST)	QTR & YR	DATE	SEQ NO.

GEORGIA STATE UNIVERSITY
CLASS SCHEDULE AND INVOICE

COURSE PREFIX and NUMBER	S	COMPUTER NUMBER	TIME	HOURS CR	ROOM and BUILDING	STATUS	AMOUNT	FEE DEADLINE
								THIS SCHEDULE MUST BE PRESENTED INTACT TO STUDENT ACCOUNTS FOR PAYMENT OR CONFIRMATION OF SCHEDULE CHANGES BY 7:00 P.M. ON THE ABOVE DATE OR IT WILL BE VOID. Student's Signature

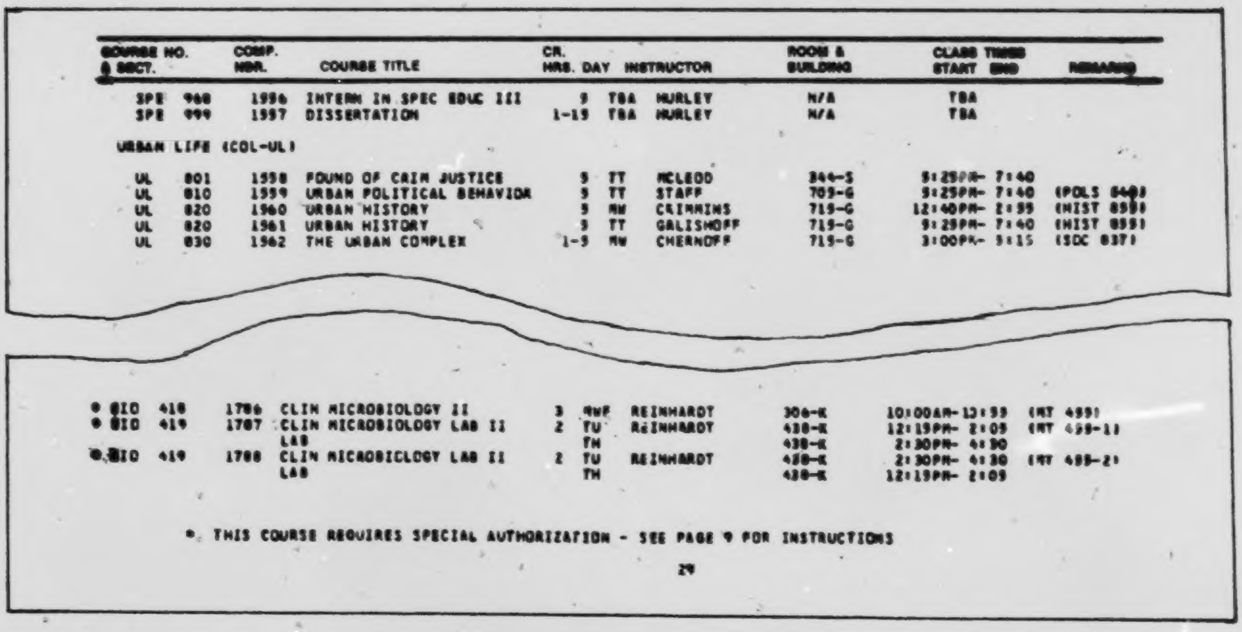
MAT	NON-RES FEES	ACT FEE	PAY THIS AMOUNT

IMPORTANT: FEES AND REFUND AMOUNTS ARE SUBJECT TO VERIFICATION BY STUDENT ACCOUNTS.

REGISTRAR COPY

Reg. 86, 3/77 OpScan Data-Reflex E 7164:84321

QUARTERLY SCHEDULE OF CLASSES BULLETIN



COURSE NO. & SECT.	COMP. NBR.	COURSE TITLE	CR. HRS.	DAY	INSTRUCTOR	ROOM & BUILDING	CLASS TIMES START END	REMARKS
SPE 960	1956	INTERN IN SPEC EDUC III	5	TBA	HURLEY	N/A	TBA	
SPE 999	1957	DISSERTATION	1-15	TBA	HURLEY	N/A	TBA	
URBAN LIFE (COL-UL)								
UL 801	1958	FOUND OF CRIM JUSTICE	5	TT	MCLEOD	344-S	5:25PM- 7:40	
UL 810	1959	URBAN POLITICAL BEHAVIOR	5	TT	STAFF	709-G	5:25PM- 7:40	(POLS 840)
UL 820	1960	URBAN HISTORY	5	MW	CRIMMINS	719-G	12:40PM- 2:55	(HIST 859)
UL 820	1961	URBAN HISTORY	5	TT	GALISHOFF	719-G	5:25PM- 7:40	(HIST 859)
UL 830	1962	THE URBAN COMPLEX	1-5	MW	CHERNOFF	719-G	3:00PM- 5:15	(SOC 837)
* BIO 418	1786	CLIN MICROBIOLOGY II	3	MWF	REINHARDT	306-K	10:00AM-11:55	(MT 455)
* BIO 419	1787	CLIN MICROBIOLOGY LAB II	2	TU	REINHARDT	438-K	12:15PM- 2:05	(MT 455-1)
		LAB		TH		438-K	2:30PM- 4:30	
* BIO 419	1788	CLIN MICROBIOLOGY LAB II	2	TU	REINHARDT	438-K	2:30PM- 4:30	(MT 455-2)
		LAB		TH		438-K	12:15PM- 2:05	

*. THIS COURSE REQUIRES SPECIAL AUTHORIZATION - SEE PAGE 9 FOR INSTRUCTIONS

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APPENDIX D

SUMMARY OF SYSTEM CHARACTERISTICS

REGISTRATION SUMMARY

1. A Registration Permit and Appointment Notice is mailed to all eligible students.
2. The student fills out and submits a Registration Course Request (Opscan) form.
3. The student is given schedule results in less than ten minutes.
4. The student leaves the Area. Fees can be paid immediately or at a later time prior to the fee deadline.
5. Appointments that present a problem can be changed to a later date and/or time.
6. The student obtains course authorizations, overload approvals, hold waivers, and overflows as needed to submit along with the course request form.

TYPICAL CALENDAR (1979)

Mar 3-11	Phase I Registration
Mar 14	Classes End
Mar 17-20	Exams
Mar 26-30	Quarter Break
Mar 26-28	Phase II Registration
Mar 31	Classes & Late Reg. Begin
Apr 2	End Late Registration

EQUIPMENT SUMMARY

Machine	Available	Normal Usage
Opscan 17	4	2
GE Terminet 300	3	1
GE Terminet 1200	3	2
TI 745	2	2
*Various Videos	9	1
Univac 90/80	2	1

*All used during Phase II and Late Registration

STAFF REQUIREMENTS

1	Full-time Registration Coordinator
2	Half-time Registration Clerks
6	Student Assistants for Appointment Office
6	Student Assistants for Registration Area
1	Registration Consultant (Regular Staff Rotate on a Two-Hour Basis)

QUARTERLY PROFILE

	Days	% of Students
Phase I	6-8	82%
Phase II	3	14%
Late Registration	3	4%

-Special Registrations for New Student Orientation and Special Categories
-Approx. 5,000 Students Pay on Fee Deadline

VOLUME OF ACTIVITY

30,000	Registration Opscan Forms Used
25,000	Class Schedule & Invoices Processed
2,500	Problem Forms Printed
10,000	Special Requirements Forms Processed
4,000	Students Drop/Add Involving Some 10,000 Transactions
25,000	Schedule of Classes Bulletins Printed

FORMS USED

- * -Registration Course Request Form
- * -Special Requirements Form, Used:
  - Course Authorizations
  - Hold Waivers and Overflows
- * -Class Schedule and Invoice Form
- -Registration Permit and Appointment Notice
- -Hours Overload Form

*These are Opscan Forms

SYSTEM FEATURES

1. Section Rollover
2. Only One Simple Registration Form
3. Same Simple Procedure and System for All Phases of Registration
4. No Drop/Add Day - Students Can Drop/Add Any Time
5. Students Given Schedules as They Register
6. Less Than Ten Minutes Required for Over 80% of Students to Register
7. Only One Trip to Complete Registration
8. No Long Lines at Registration
9. Efficient in Terms of Staff and Equipment
10. Appointment Cards Mailed Bulk Rate - Prevents Students from Standing in Line to Pick Them Up

COST TO REGISTER A STUDENT

$1.44/Quarter - Includes Cost of Forms, Personnel, Equipment, and Computer Time

LIST-LESS PROGRAMMING

Kelly C. McDonald   Donald J. West
Brigham Young University
Computer Services
Provo, Utah 84602

To a programmer, security is a warm program listing. In fact, it's a desk top and room full of listings. Listings have become one of the identifiable tools of our trade, so much so that to be without such a volume and array of listings around us, others become suspicious of our productivity. An array of listings around a programmer can also serve as camoflouge that the programming is not quite finished, therefore, documentation need not be written.....yet.

D.J.'s law of documentation states:

> "The volume of listings in, under, and around a programmers work station is inversely proportional to the amount of documentation produced by the same programmer."

The authors propose to preach heresy among all programmers and profess that it is possible and even desirable to do away with program listings forever, thereby providing us all with a clean desk to eat lunch at.

The key elements in accomplishing this are discussed in this paper and are:

1. A Program Library Management System
2. An interactive Teleprocessing System
3. An On-line Microfiche System
4. Microfiche readers for each programmer

Steps 1 and 2 are familiar to many Computer installations. The authors will discuss in detail steps 3 and 4 which are options now available to Computer users in-house. Also discussed are the advantages derived from List-less programming.

LIST-LESS PROGRAMMING

At Brigham Young University we are encouraging our programmers to become listless. That is, we have encouraged them to do away with program listings. This has been difficult, because to a programmer, security is a warm program listing. In a Computer Center, you will always find a programmer meditating over a warm program listing, hot off the printer. Yes, security is a warm-program listing. In fact, it is a desk top and a room full of listings. Listings have become one of the identifiable tools of our trade, to be without such an array of listings around us, others begin to become suspicious of our productivity.

An array of listings around a programmer can also serve as camouflage that the programming is also not quite finished. Therefore, documentation need not be written. . . . yet.

DJ's Law of documentation states, "The volume of listings in, under, and around a programmer's work station is inversely proportional to the amount of documentation produced by the same programmer."

ADVANTAGES OF LISTINGS

We would like to point out the following advantages to having program listings:

LIST-LESS PROGRAMMING

- It makes the Programmers look busy with all the listings piled around them.
- Stacks of listings may be used as a smokescreen that the program is not ready yet for documentation.
- Listings enhance the economy of the paper industry.
- They provide a constant source of high quality recyclable paper.
- Office equipment suppliers are happy to provide file-cabinets, binders, etc.
- It keeps the Computer Operators busy tending the printers, seperating output, decollating and bursting the listings.
- The portability of listings is evidenced by the fact that they have been known to show up everywhere but the program library, particularly during the middle of a critical production run when the program must be fixed.

DISADVANTAGES OF LISTINGS

LIST-LESS PROGRAMMING

Most of you have worked around listings and are familiar with many of the disadvantages such as:

- A lot of paper is consumed. At our installation an average COBOL compilation consumes an average of 120 pages. Also, storage space and equipment for paper continue to be increasing costs.
- Printers are constantly backing up trying to keep up with the printing demands.
- Listings are difficult to store. Their oversize makes it difficult to store them in standard cabinets and desk drawers.
- Copies of listings are time-consuming to make on a copy machine.
- Operator intervention is required in tending the printer, aligning forms, seperating output, etc.

WE PROPOSE TO PREACH HERESY AMONG ALL PROGRAMMERS AND PROFESS THAT IT IS POSSIBLE, EVEN DESIRABLE TO DO AWAY WITH PROGRAM LISTINGS FOREVER, THEREBY PROVIDING US ALL WITH A CLEAN DESK TO EAT LUNCH AT!!!

At Brigham Young University the key elements that we use in helping our programmers become more list-less are the following:

LIST-LESS PROGRAMMING

1. A Program Library Management System. At BYU we've had such a system since 1973. All of our programs, JCL, file descriptions and object modules are on our program library management system.

2. An Interactive Teleprocessing System. Our system was written in-house and is called HONCHO. Approximately one hundred and twenty five terminals are on line to an IBM 360-65. The response time averages between 1-2 seconds. Terminals are located in programmer work areas. There is approximately one terminal for two to three programmers. Programmers have access to system activity through any terminal.

3. An On-line Microfiche system. Many of you already have at your installation the first two key elements mentioned above. This third key element is fairly unique around the country and much of this paper will be devoted to how this helped complete our list-less method to programming.

4. Microfiche readers for each programmer. In conjunction with our Microfiche system we obtained small, inexpensive desk-top readers for each programmer.

LIST-LESS PROGRAMMING

BYU began using COM back in 1970 at a Salt Lake Service Bureau. Our COM usage grew fairly slowly but steadily through the years. Figures 1-5 show our COM activity from August of 1976 to September of 1979. Because Salt Lake City is about 45 miles from BYU in Provo, many of our users were waiting three to five days for their microfiche; consequently, applications that required microfiche sooner were not possible and Users had to obtain a printed copy of the lists while waiting. Users were asking if there was anyway they could get their microfiche faster because they recognized the convenience and lower costs of Microfiche. After the Microfiche did come back from Salt Lake City, they threw the paper listings away.

Because of these User requests, In 1977 we began investigating the possibilities of doing our own COM in-house. Many manufacturers literature claimed that it was possible to produce COM with a built-in processor and not have a COM expert. We made inquiries to different vendors and they sent us their literature and sales personnel.

A list of COM features that we felt were important was made. Each item was given a weight factor. Some of the features we considered are:

- QUALITY. Was the film archival? We selected full-reversal (clear characters/dark background) over non-reversal (dark characters/clear background) because of the more 'forgiving' nature of the film. We checked character clarity, formation and contrast for readability.

- RELIABILITY. We wanted equipment that was proven in the field, had local maintenance and parts that was serviced by a reputable company.

- EASE OF OPERATION. We wanted a system that was easy to operate with a push-button type of operation not requiring a COM expert babysitting the COM all the time. We have a lot of part-time student operators at our installation and it is important that the training is not extensive and that the equipment that they operate is easy to use.

- GOOD SOFTWARE. It was extremely important that the microfiche software be very easy to use but yet have a variety of features for those Users and programmers who require sophisticated Microfiche; however, for those who wanted to simply have their output on microfiche but didn't want to use all the features we required that the system allow them to do this simply. It was an absolute requirement that no program changes be required to existing or future programs using Microfiche output.

- COST. After a careful analysis of our charging policy we determined that if our COM usage approached $2,000 a month to the service bureau, it would then be economical to bring it in-house, using our own COM System. Figure 5 indicates we were fluctuating in our costs from month to month depending on our cycles in the semester. Our average was slowing moving up to that critical $2,000 level.

Our committee made a recommendation that we seriously consider obtaining our own microfiche system. We received permission to pursue this and while we were pursuing our studies of the different systems available, one of the vendors indicated an on-line option on their particular system. Our committee then began investigating the advantages or disadvantages of on-line versus off-line COM. On-line was a new approach to COM and one that had not been used in very many installations around the country. As we studied this, we found that there were advantages of on-line versus off-line. They are:

1. Faster turnaround. Output is routed directly to the COM unit.
2. No tape handling.

3. High speed 'printing'. The COM unit looks like a printer to the system and operates at an average speed of 14,000 lines per minute.

4. Job charge availability. Jobs can be charged for microfiche usage at the time they are run through system accounting procedures.

After taking all the factors above and their weighting into consideration the COM committee recommended the purchase of our own in-house COM processor and duplicator. We selected the Quantor Q1020 (now the NCR Q1020) on-line microfiche processor and the companion Quantor 205 microfiche duplicator. The system was installed in late December of 1978. It took us two months to install the hardware and debug the software interface. The software interface had to be written for our system, the IBM-360 OS MVT HASP Operating System. We immediately began converting many of our microfiche programs from the Service Bureau over to in-house. By February of 1979 we were doing all of our COM in-house. The programmer's microfiche readers arrived in late January and this allowed our programmers to start their list-less programming.

LIST-LESS PROGRAMMING STEPS

The following steps describe our list-less method of programming:

LIST-LESS PROGRAMMING

1. When the programmer is ready to begin writing code, he or she can sit down at a terminal and immediately begin entering the program. The code itself can be written on a coding sheet or a piece of paper or they can use a skeleton program from our program library management system by using the program on the microfiche viewer as a source.

2. The program is then submitted into the computer, with the output coming to the terminal and to microfiche. The computer terminal screen can be split three ways so that a programmer can view source statements, cross-references and error messages simultaneously. All three screen areas can be paged forward or backward independently.

3. Errors may be corrected either at the terminal or at the programmer's desk using the listing from microfiche output.

4. The programmer then corrects the errors at the terminal and resubmits the programs. Programmers can monitor the status of all system activity from the terminal. The program can be tested at the terminal. Once the program is then successfully de-bugged, the programmer requests from the terminal a microfiche listing of the program.

5. The microfiche listing of the de-bugged program is given to the program librarian. The librarian integrates the program into the production library both on microfiche and in the computer program library. The microfiche library contains all of the integrated programs in the production system.

6. The program librarian places the original microfiche in the vault and makes copies that are put in the microfiche library.

Our programming staff are not the only ones using the list-less method. Our production control department has also gotten list-less. Working from a seven-day schedule board, Production clerks set up jobs on the terminal using our on-line production control system. They set up run parameters, output requirements, etc. on the terminal and submit the production jobs directly into the system where they are run in a controlled sequence. All of the Production Job Control output is recorded to microfiche, including operator messages, tape history and error messages.All run history for production jobs are then available on microfiche. The microfiche is stored in the vault enabling us to keep a permanent record of exactly what occurred when the job was run without keeping a large amount of listings around.

LIST-LESS PROGRAMMING

Our on-line COM has provided us some benefits that have been very useful. It is now possible to dump files out on COM that we were previously afraid of because of the volume of paper and the time in the printing. It also helps when we test jobs. We can now look at the entire file on COM rather than just a few records on paper. What used to take several thousand pages when a system dump was required can now be done on a few microfiche and in 1/14 of the time. We can now make quick inexpensive copies of source materials. Our copies are charged out at 20¢ per microfiche.

There has been a reduction in paper usage. COM has slowed down the growth of our single part forms, and particularly reduced significantly the use of multi-part forms.

On our system two tape drives are available for other computer systems. These systems can take advantage of our COM by creating output on tape. The tape can be read by the IBM-360 system and the data from the tape can be routed to the COM unit. The Microdata Reality and Dec-10 are two systems that we have successfully read tapes from and created Microfiche output.

There are three options available for obtaining on-line microfiche. (see figure 6).

Option-1. By coding SYSOUT=M on the output statement, Users get standard titling information on the Microfiche. This includes Job name, date, time, routing information and microfiche number.

Option-2. By inserting a //* QTLE statement users may put in their own job title and routing information.

Option-3. By coding SYSOUT=M,FCB=Mxxx where xxx is the name of a microfiche table the user has set up, Users may use all of the sophisticated features of the COM software including indexing, breaks, etc.

ADVANTAGES OF BECOMING LIST-LESS

It does pay to become list-less, both in time, convenience and dollars. Our paper savings have been significant. Our charging rates indicate that if a listing is longer than 27 pages it is cheaper to produce it on microfiche. Multiple copies are significantly cheaper at 20 cents per 270 pages. One box of film is equivalent to 19 boxes of paper, thereby reducing storage costs and handling. Turnaround is much faster and more convenient for the operators. Storage of output is reduced by 48 times. Programmers and Users store microfiche in little 4" by 6" boxes which contain up to 200 microfiche. This is equivalent to 19 full boxes of paper. They refer to these little boxes as their 'ficheing creels' where they keep their fiche. We also feel that we have better control over our programs because we always have the current production version both in the program library in microfiche and in the computer. No one ever needs to check out the only master copy and we don't allow it.

LIST-LESS PROGRAMMING

Most vendors will tell you that your microfiche usage will double after you bring it in-house. I think you can see from figures 1-5 that our COM usage has more than doubled. Because of the reliability, convenience and lower cost of microfiche, both our programmers and Users have enjoyed becoming list-less. We feel that the list-less method described has made a significant contribution to the level of computer service at Brigham Young University.

BRIGHAM YOUNG UNIVERSITY

MICROFICHE USAGE

NUMBER OF JOBS RUN

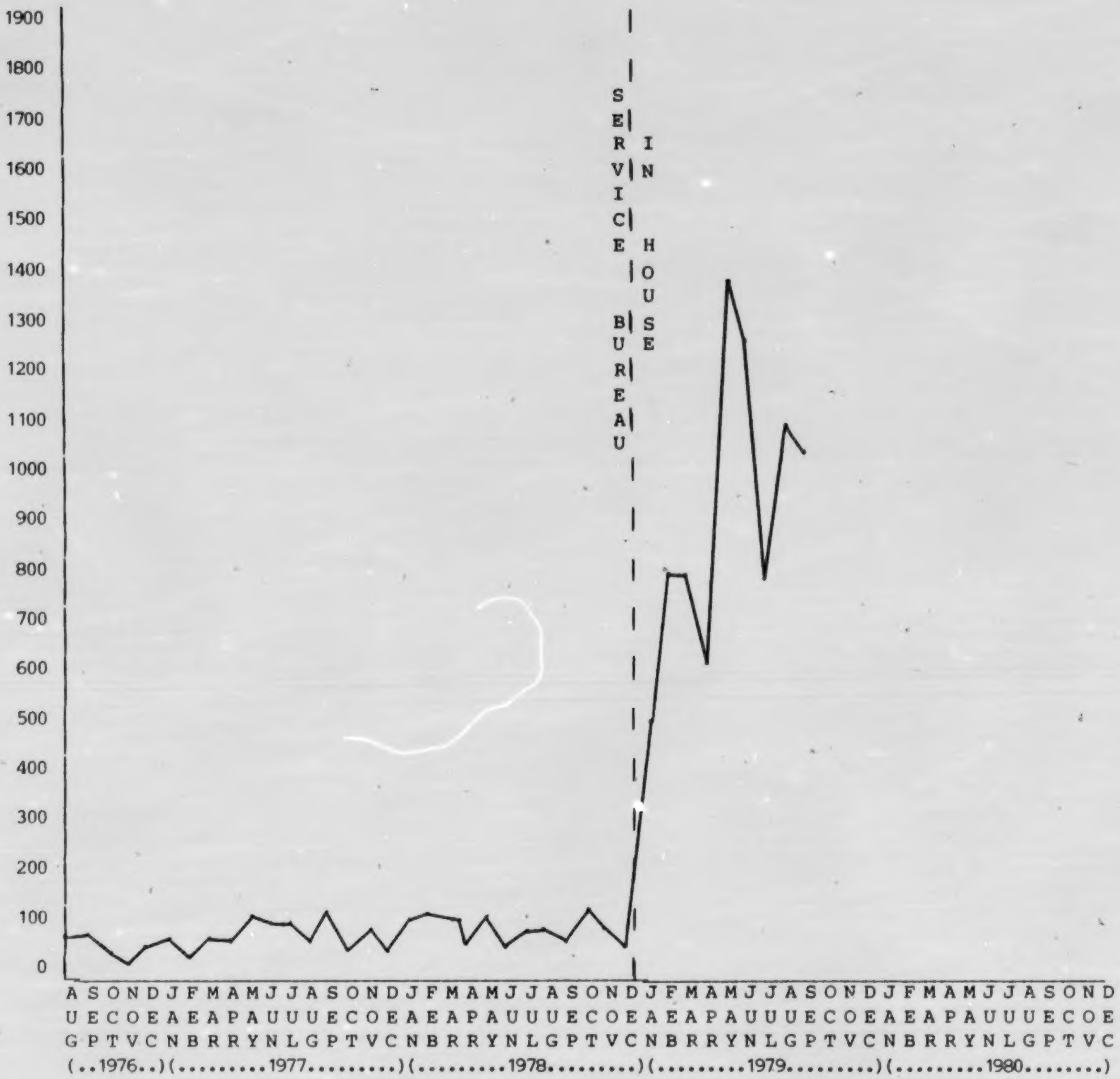

FIGURE 1

BRIGHAM YOUNG UNIVERSITY

MICROFICHE USAGE

NUMBER OF FRAMES (pages)

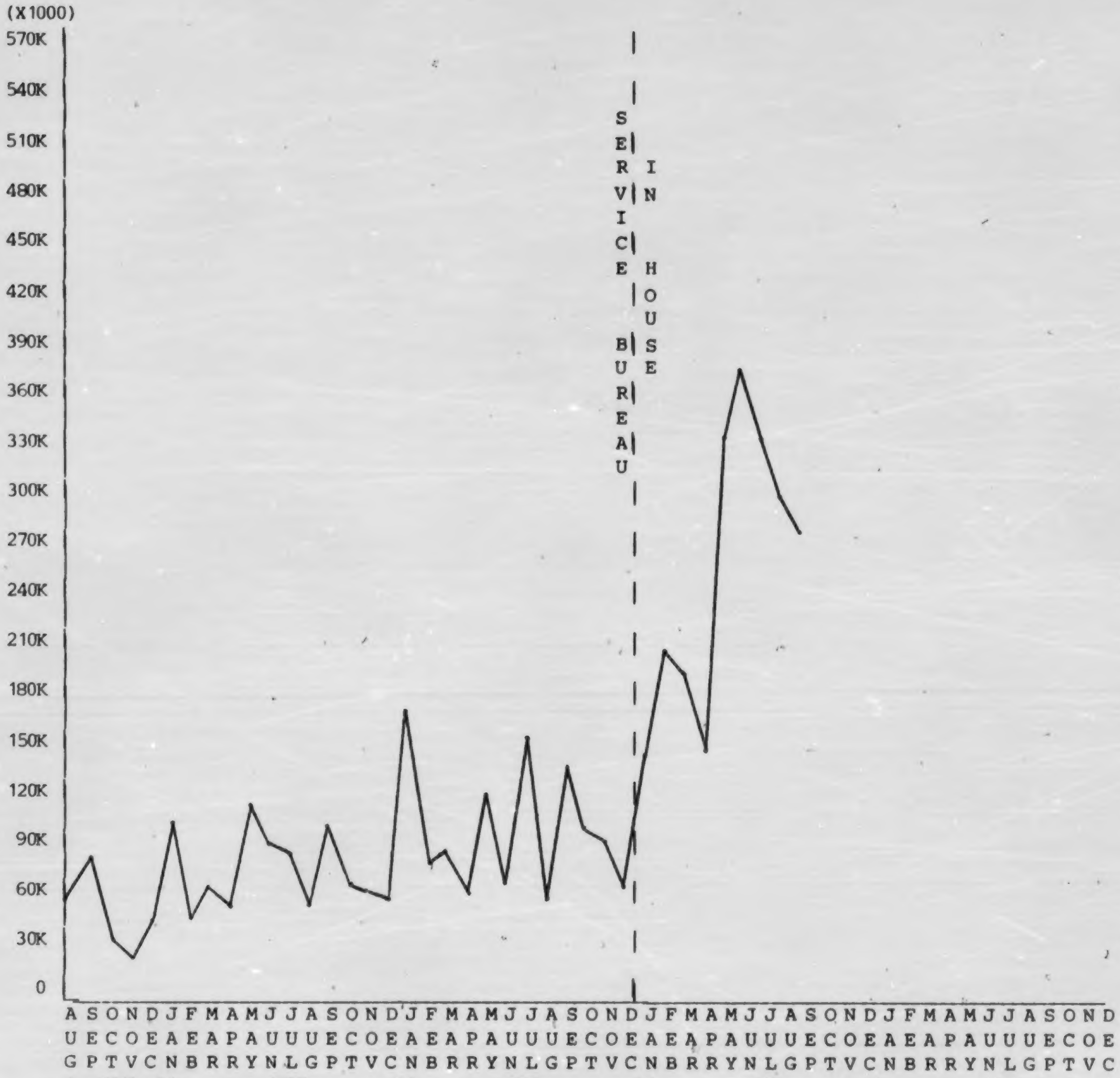

FIGURE 2

BRIGHAM YOUNG UNIVERSITY

MICROFICHE USAGE

NUMBER OF ORIGINALS

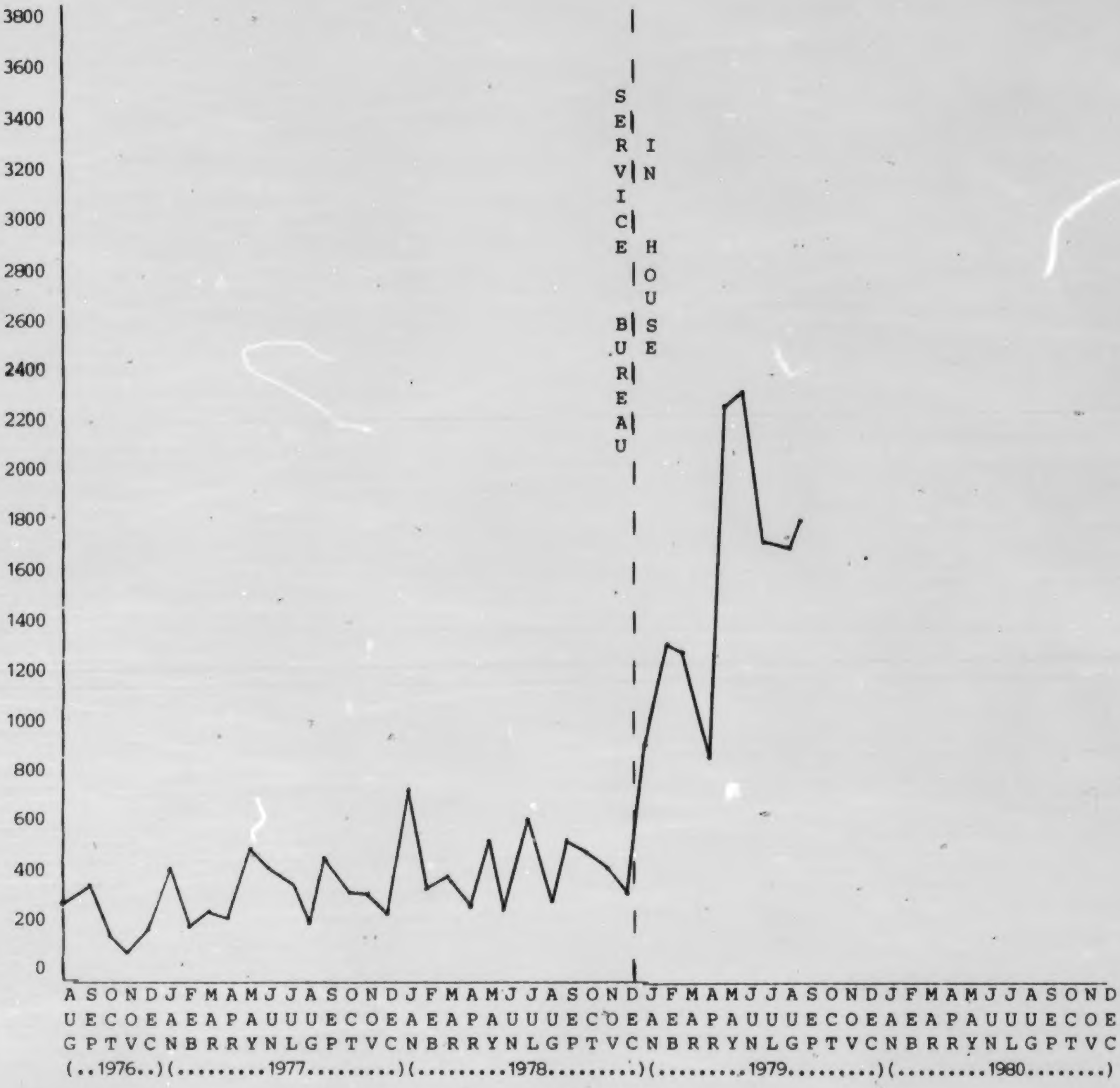

FIGURE 3

BRIGHAM YOUNG UNIVERSITY

MICROFICHE USAGE

NUMBER OF DUPLICATES

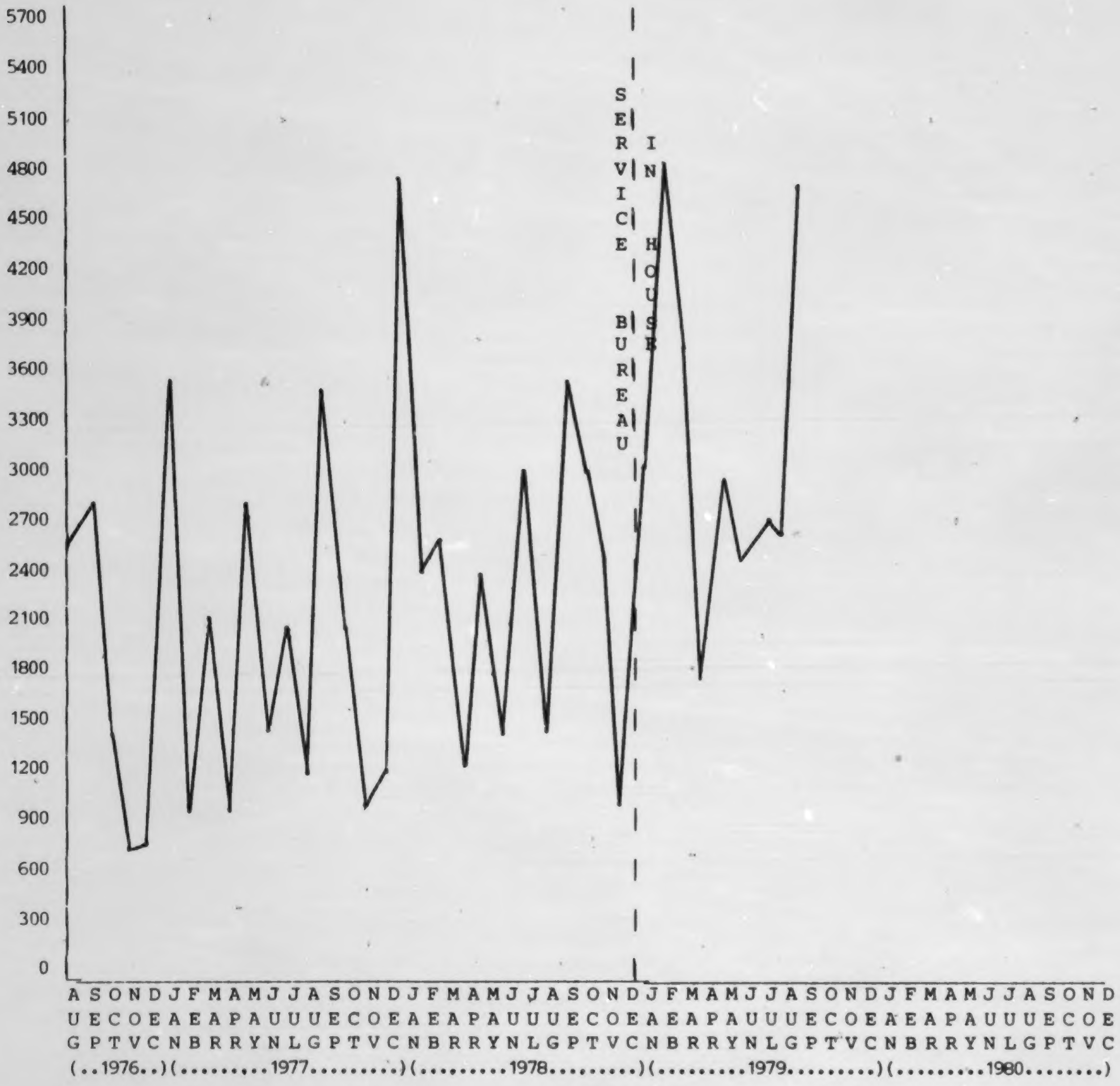

FIGURE 4

BRIGHAM YOUNG UNIVERSITY

MICROFICHE USAGE

CUSTOMER COST (dollars)

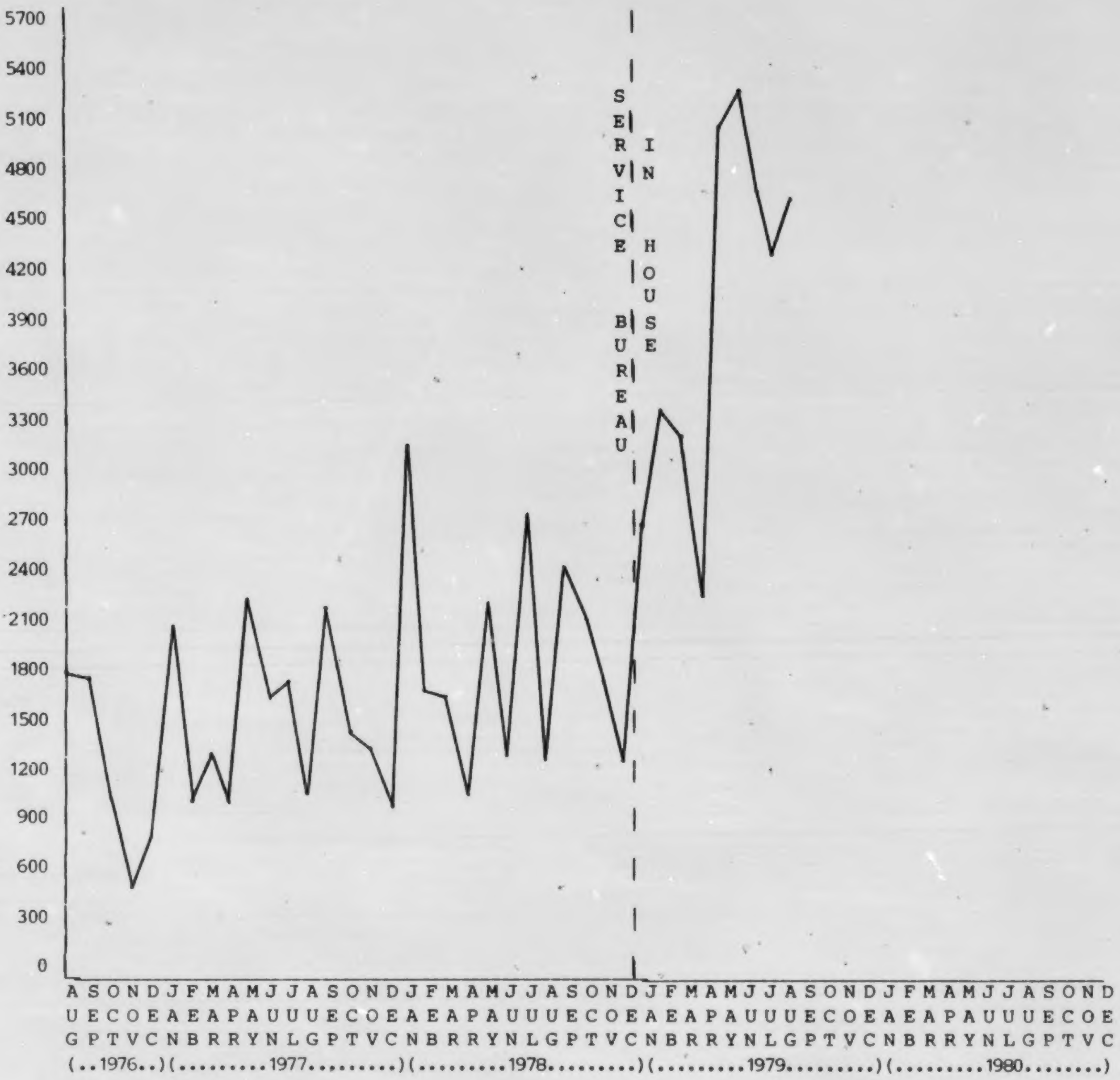

FIGURE 5

COM OUTPUT OPTIONS

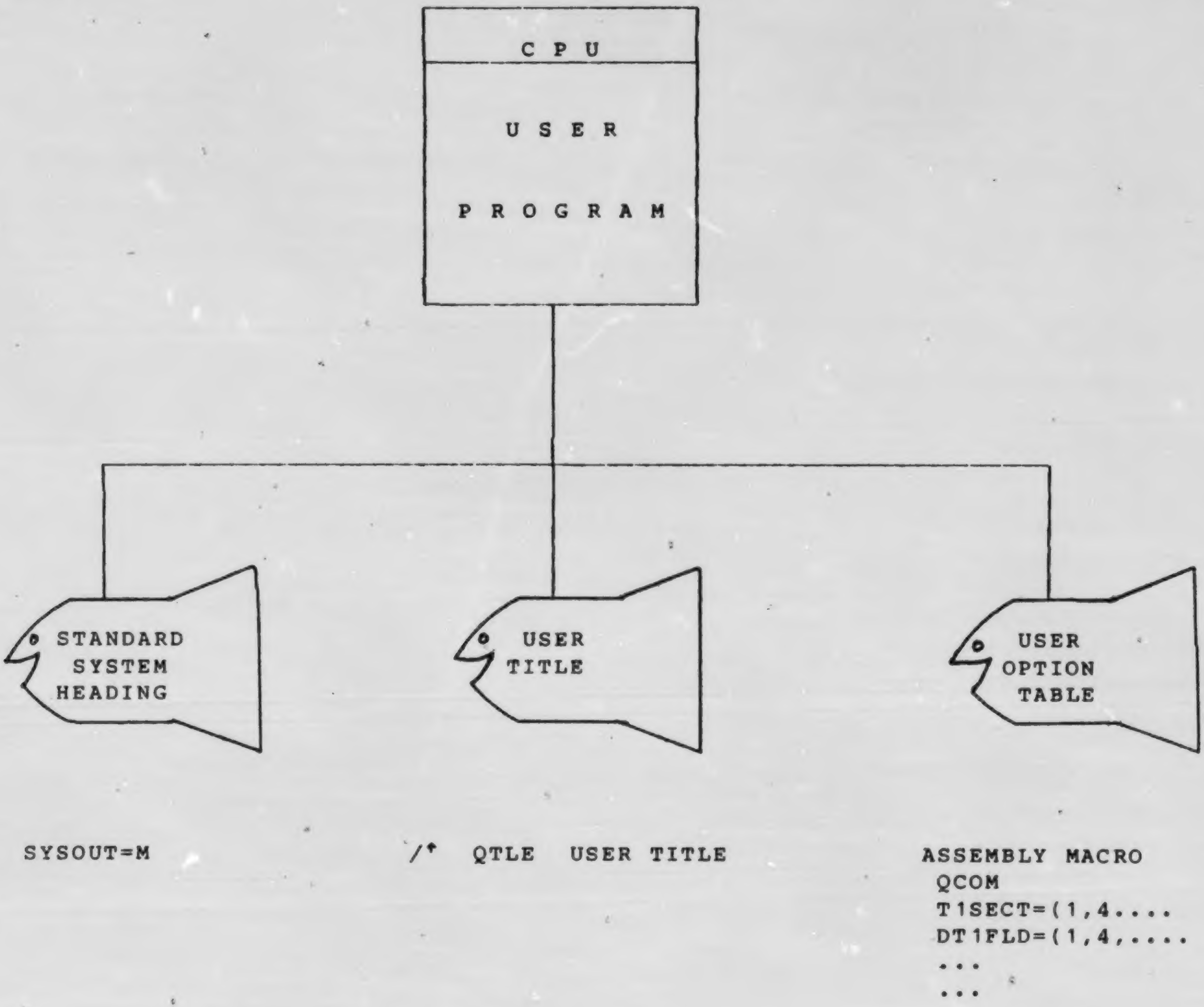
CPU
USER
PROGRAM
STANDARD
SYSTEM
HEADING
USER
TITLE
USER
OPTION
TABLE
SYSOUT=M
/* QTLE USER TITLE
ASSEMBLY MACRO
QCOM
T1SECT=(1,4....
DT1FLD=(1,4,....
...
...

FIGURE 6

PROJECT MANAGEMENT/STANDARDS USED IN A RECENT IMS ON-LINE SYSTEM IMPLEMENTATION

Sandra T. Dennhardt
Associate Director for
University-Wide Development
University of Illinois
Urbana, Illinois

This paper discusses project control techniques used in the recent implementation phase of a major IMS on-line system including structured programming standards, programming progress checkpoints, Data Base Administration checkpoints, and monthly reporting to the user committee. In addition, it discusses the advantages of the project control techniques in handling the problems of team attrition, the subsequent addition of new team members, and the personnel management difficulties of a development team positioned in two locations.

INTRODUCTION

In the summer of 1977, our office contracted with an outside consultant in order to answer the growing needs of the University of Illinois Foundation and the Alumni Association. Arthur Andersen and Company was chosen as the consultant because of their systems development strength and their previous work on Northwestern University's gift system.

The requirements phase for the Alumni/Foundation Information System (usually referred to as AFIS) was completed during the summer of 1977, and the preliminary systems plan, in December 1977. The detailed system design, which resulted in the final data base design and detail program specifications was completed in July 1978. (See Exhibit 1). Up to this point, the consultants had been an integral part of the analytical work and had retained project leader responsibility for AFIS. Our office then assumed total responsibility for the implementation of the system. Part 1 of the AFIS implementation was installed into production on August 3, 1979. We are now in the planning preparation stage before beginning on the implementation of Part 2, which comprises the remaining portions of the AFIS system. Completion date for this portion of the AFIS system is anticipated, at this point, as being the end of 1980.

At the start of the implementation of AFIS Part 1, our office felt the need for a sound project management approach to ensure success. The consultants had a definite project management style to which the user offices had become accustomed. In addition, our data

AFIS PROJECT HISTORY

PHASE	DATE COMPLETED	MAN-YEARS EXPENDED
I. PRELIMINARY SYSTEM DESIGN	12/77	6
II. DETAIL DESIGN	7/78	
III. IMPLEMENTATION		
PART 1	8/79	9
PART 2	?	5 EST.
	TOTAL	20

EXHIBIT 1

processing team had not been involved with a project of this size or complexity, nor had our office provided a direct data processing service for this user in the past. Our progress awareness and team communication would have to be sufficient to produce a product responsive to the high expectations of our users.

What project management procedures were followed and how well they succeeded are the topics discussed in this paper.

ORGANIZATIONAL ENVIRONMENT

The University of Illinois is a multi-campus university, consisting of the campus located in Urbana-Champaign, and the Circle and Medical Center campuses located in Chicago, with a total enrollment this fall of 59,584. There are two administrative levels -- one for campus administration, and one for general university administration. There are three campus data processing offices for administrative requirements which report to the appropriate campus vice chancellor; and there is one data processing office for administrative requirements which reports to the Associate Vice President for Administrative Information Systems and Services at the general university level. (See Exhibit 2). The determination of which systems are the concern of the campus level and the general university level rests upon whether the major user of the system is from the campus administration or general university administration.

All three campus administrative data processing offices as well as our office (Administrative Information Systems Development) perform

GENERAL UNIVERSITY ORGANIZATION

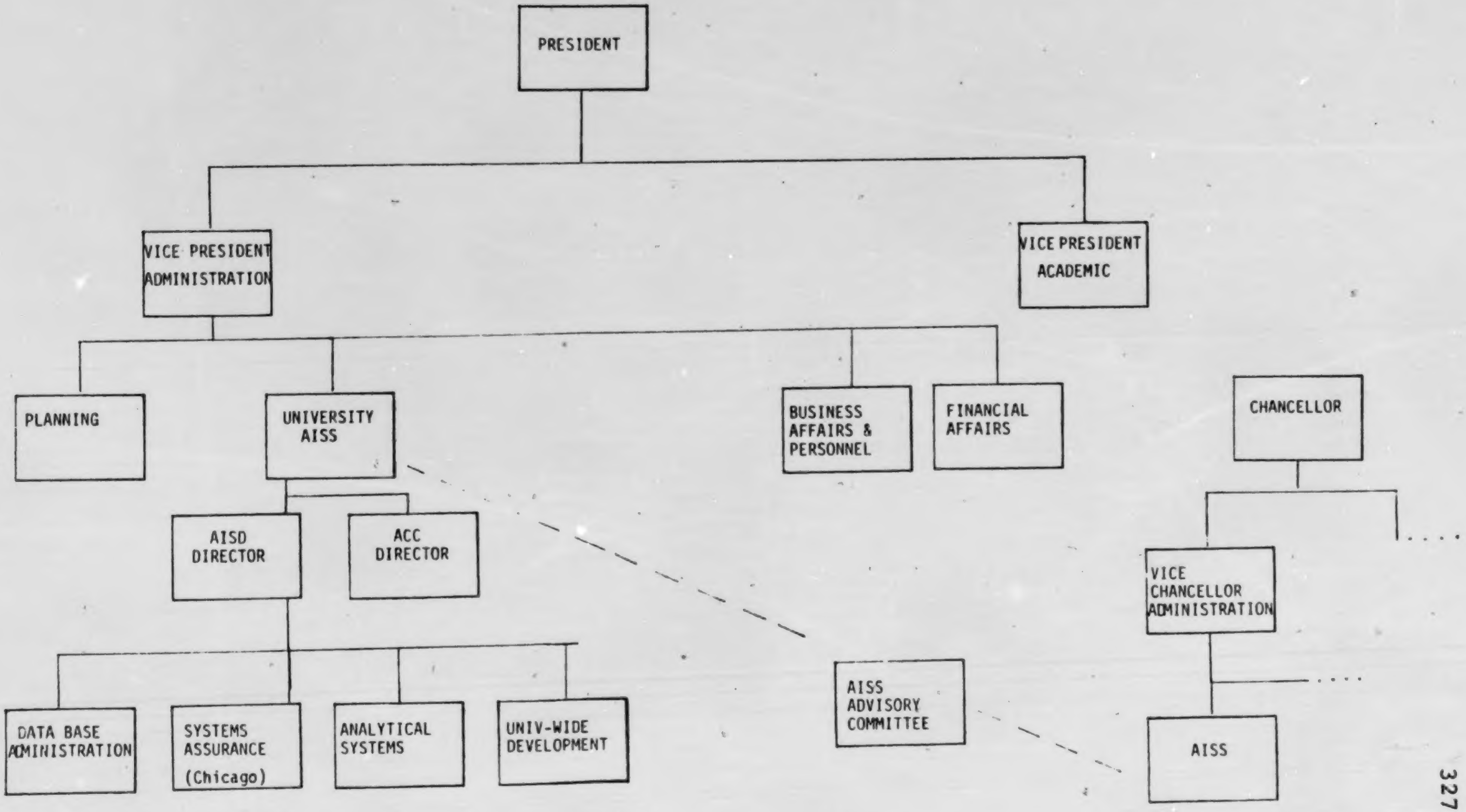
PRESIDENT
VICE PRESIDENT ADMINISTRATION
VICE PRESIDENT ACADEMIC
PLANNING
UNIVERSITY AISS
BUSINESS AFFAIRS & PERSONNEL
FINANCIAL AFFAIRS
CHANCELLOR
AISD DIRECTOR
ACC DIRECTOR
VICE CHANCELLOR ADMINISTRATION
DATA BASE ADMINISTRATION
SYSTEMS ASSURANCE (Chicago)
ANALYTICAL SYSTEMS
UNIV-WIDE DEVELOPMENT
AISS ADVISORY COMMITTEE
AISS

EXHIBIT 2

their functions by remote job entry to the mainframe IBM System 370/168 (OS/MVS) computer located in Chicago and operated by the Administrative Computer Center. Our office is divided between two locations -- one in Urbana and one in Chicago. Our Urbana office uses the remote job entry facility, while our Chicago office shares job entry/output facilities with the Administrative Computer Center.

The total number of staff full time equivalents in our office is 35.25 FTE, with 11.65 located in Chicago and 23.6 located in Urbana. There are four major functional divisions; Data Base Administration, which provides data base system support and consulting for the general university and campus offices; Analytical Systems, which provides support for rapid information retrieval and small systems development; University-Wide Development, which provides design and implementation support for all large-scale general university systems; and Systems Assurance, which provides maintenance support for general university systems. (See Exhibit 3).

Neither the Alumni Association nor the Foundation are part of the general university administration. In the past, the Urbana campus data processing office had provided services for these offices since their main offices are located in Urbana. The Alumni Association has an office at each campus, with the executive director located in Urbana. The Foundation has its larger office at Urbana, where the executive director is located, and a smaller office situated at the Chicago Circle campus in a general university building. Because the two offices are situated side by side at the major locations, and

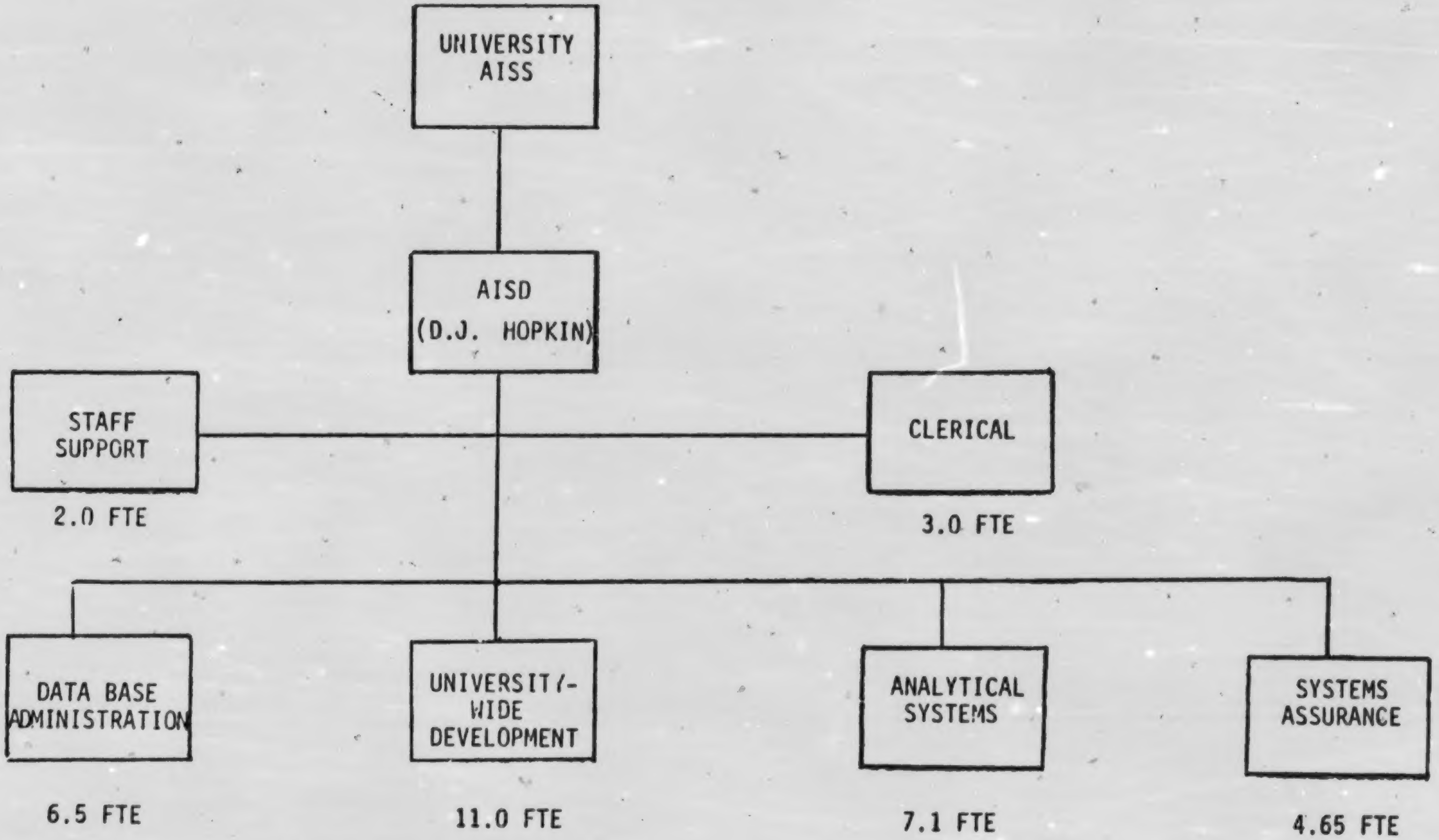
UNIVERSITY AISS
AISD (D.J. HOPKIN)
STAFF SUPPORT
2.0 FTE
CLERICAL
3.0 FTE
DATA BASE ADMINISTRATION
6.5 FTE
UNIVERSITY-WIDE DEVELOPMENT
11.0 FTE
ANALYTICAL SYSTEMS
7.1 FTE
SYSTEMS ASSURANCE
4.65 FTE

EXHIBIT 3

because they share much of the same basic alumni data, they decided to combine their needs within one system request. Due to a lack of available resources at the Urbana data processing office and the logical identification of the Foundation and Alumni Association offices as more "general university" type users, rather than campus only, the responsibility for developing the system came to our office.

PROJECT ORGANIZATION

It was a serious blow to the team structure, when the South team leader left our office in fall 1978 and no experienced replacement was available at the time. Exhibit 4 shows the AFIS implementation team as it began work on Part 1, while Exhibit 5 shows the team as it existed at the end of Part 2. The project leader was required to fill both roles. In order to provide backup assistance for the project leader, the Assistant Director for large-scale development became a co-project leader for the duration of Part 1. Two additional programmer/analysts were added to the team in January 1979, and another in March 1979. These last three staff members were new to IMS system development work. The two programmer/analysts in the North team had minimal experience with IMS. Since most of the reports were to be coded using MARK IV, and no MARK IV programmer was free to be assigned to AFIS, the MARK IV requests were contracted out to two different firms. The Assistant Director became the coordinator for this function.

In addition, one of the members of the Data Base Administration

AFIS

PROJECT TEAM

ORGANIZATION - 8/78

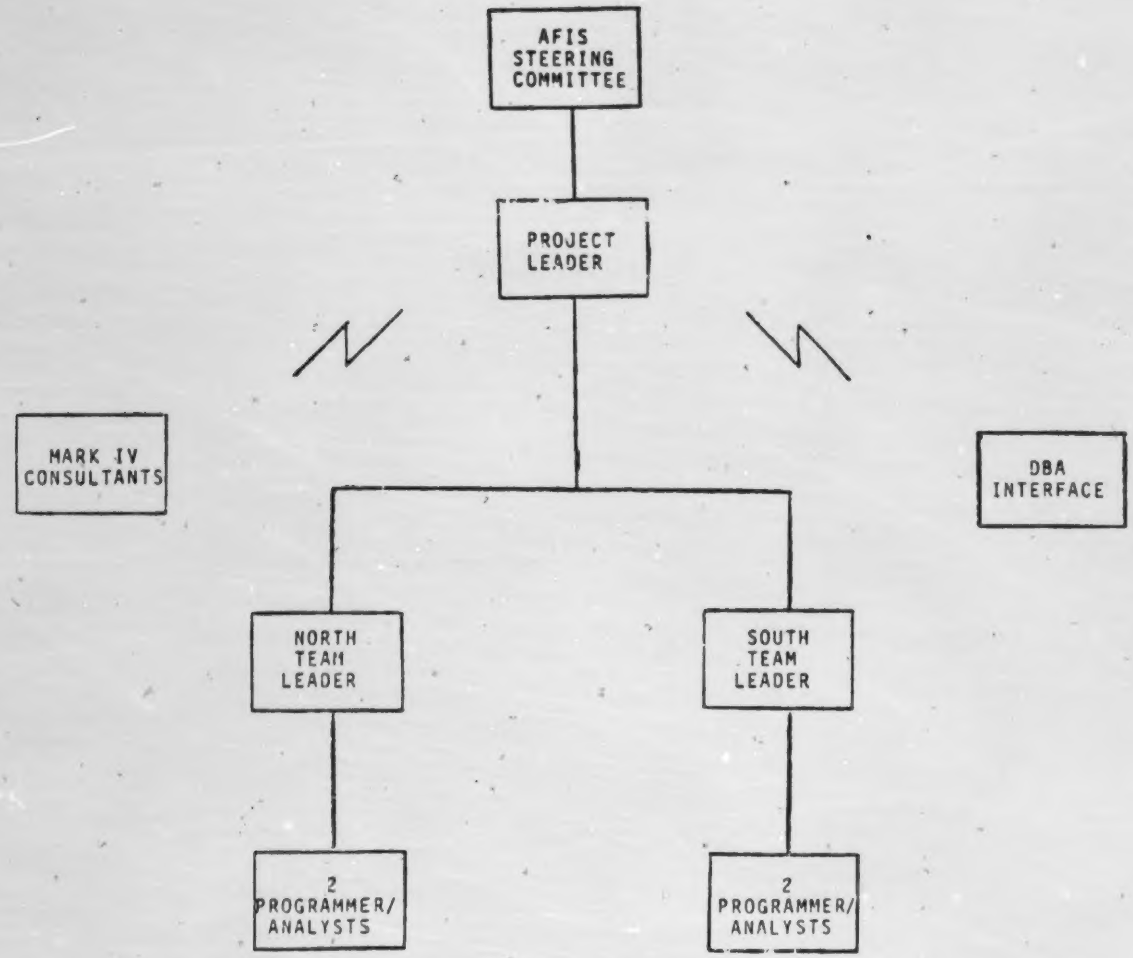
AFIS STEERING COMMITTEE
PROJECT LEADER
MARK IV CONSULTANTS
DBA INTERFACE
NORTH TEAM LEADER
SOUTH TEAM LEADER
2 PROGRAMMER/ ANALYSTS
2 PROGRAMMER/ ANALYSTS

EXHIBIT 4

AFIS

PROJECT TEAM

ORGANIZATION - 7/79

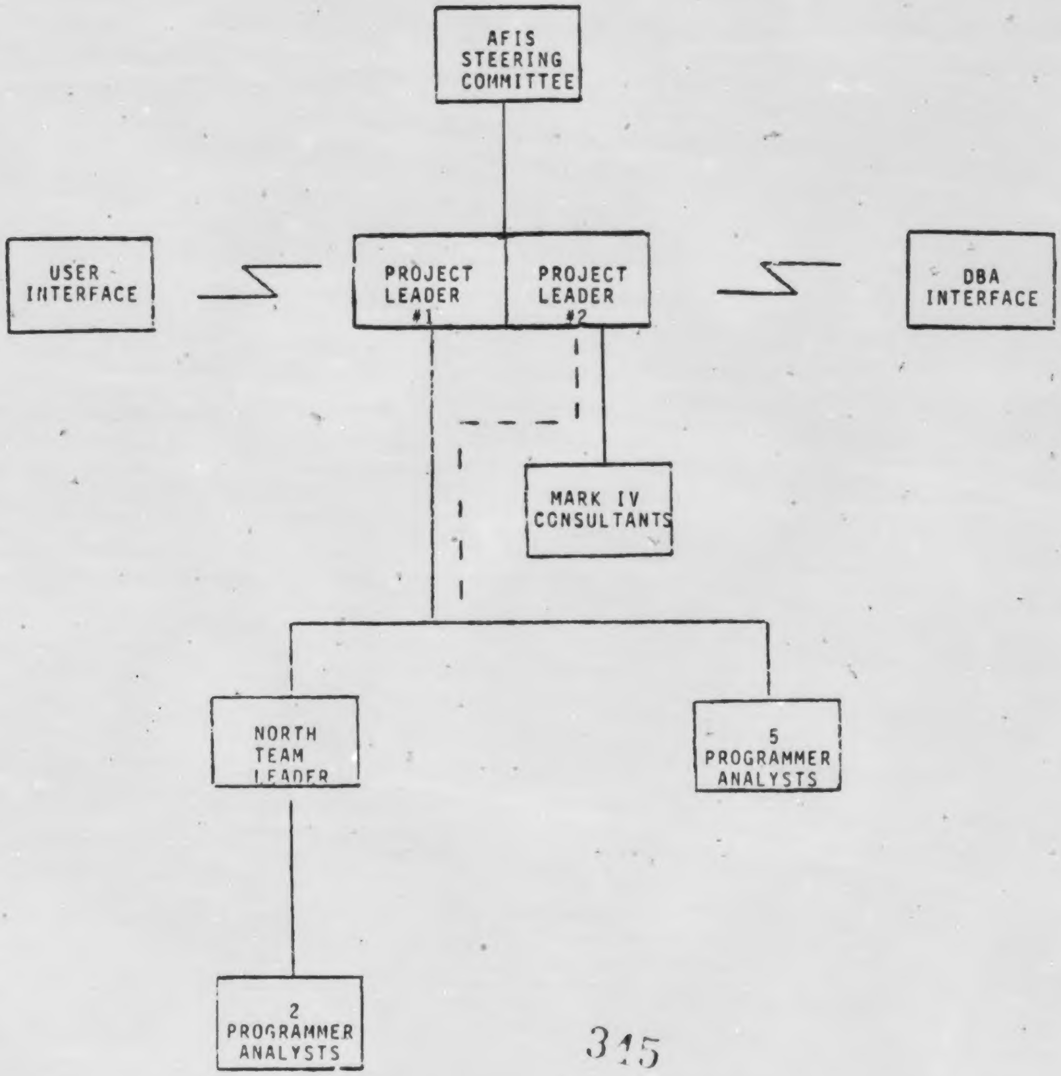
AFIS STEERING COMMITTEE
USER INTERFACE
PROJECT LEADER #1
PROJECT LEADER #2
DBA INTERFACE
MARK IV CONSULTANTS
NORTH TEAM LEADER
5 PROGRAMMER ANALYSTS
2 PROGRAMMER ANALYSTS

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EXHIBIT 5

group was assigned as the main data base consultant and liaison. Halfway through Part 1, this function consumed nearly all the time of two members of the Data Base group.

Closely affiliated with the project team was the main Foundation office liaison person, who answered detail questions and reviewed inputs/outputs formats and system interfaces with the user office. He was completely responsible for the production of user documentation, which he prepared after interviews with the programmers associated with each function. In addition to making sure the documentation was in user-oriented language, an additional advantage gained was that at least one user became trained in all aspects of the system before system installation.

The project leader, team leaders, and the Foundation interface person reported all progress and problems to the AFIS steering committee at a regularly scheduled monthly meeting. The AFIS steering committee consisted of user representatives from both the Alumni and the Foundation offices; the Director, and the Assistant Director for University-Wide Development from our office, the project leader, team leaders; and the Foundation interface person. All major issues were brought before this committee for resolution.

PROJECT MANAGEMENT

The project management approach was partly patterned after the procedures used by the Arthur Andersen consultants and partly based on our own experiences with previous IMS data base systems. A set of forms was adopted or drafted to add in tracking and controlling the project. Copies of these forms are provided in the appendix to this article. There were two major concerns: the first, ensuring that communication between team members and the North and South teams did not fail; the second, being certain that adequate reviews would provide correct code within the target dates allotted. It was hoped that good communication, team leader reviews, and the team approach for reviewing programs would help address the problem of the IMS inexperience of members of the team, as well as the physical separation of the two teams.

The following outlines the management tasks used:

1. Project Orientation
2. Estimating - Two Approaches
3. Work Assignments
4. Communication Memos
5. Project Status Reporting
6. Program Development Standards

PROJECT ORIENTATION

Before the AFIS project teams began work on the implementation of Part 1, the project leader prepared and held an orientation session for all the team members, North and South, at one time. This was intended to provide general information about the AFIS system, an explanation for use of the project control forms, specific information about the programs to be worked on and how they would interface, and to help promote cohesiveness between the teams. The Director of AISD led off this session with an informative discussion of the user's expectations. In addition, a member of the Data Base Administration group presented information on support provided and guidelines to be followed. Exhibit 6 shows the major categories from the orientation agenda.

Each attendee was given a booklet of handouts covering all topics discussed, for future reference. As new members were asked to the project teams, this booklet was used in orientation meetings to give the newcomers the same introduction. A major concern of project management is ensuring good communication, and a feel among team members for the overall system review. This procedure was a good first step.

ESTIMATING

There were two sets of estimates prepared for the implementation phase. Immediately following the detail design phase, the consultants worked with our staff to divide the system into two parts to make the implementation more manageable, with most of the Foundation functions being completed in Part 1. In addition, estimates were prepared based largely on experience rather than a formalized procedure. Exhibit 7 shows the schedule developed from this estimate, with a completion date of April 1, 1979, for Part 1.

With the critical loss of the team leader and a change of

AFIS

PHASE III ORIENTATION AGENDA

9/01/78

I. INTRODUCTION TO AFIS PHASE III

- A. AFIS PERSPECTIVE
- B. PROJECT PERSONNEL AND ORGANIZATION
- C. USER PERSONNEL
- D. BRIEF PROJECT HISTORY
- E. AFIS OVERVIEW
  - 1) CURRENT SYSTEMS
  - 2) NEW SYSTEM - AFIS
- F. PHASE III OVERVIEW

II. FOUNDATION PHASE III ASSIGNMENTS

III. PROGRAM DEVELOPMENT STANDARDS AND GUIDELINES

IV. PROJECT STATUS REPORTING

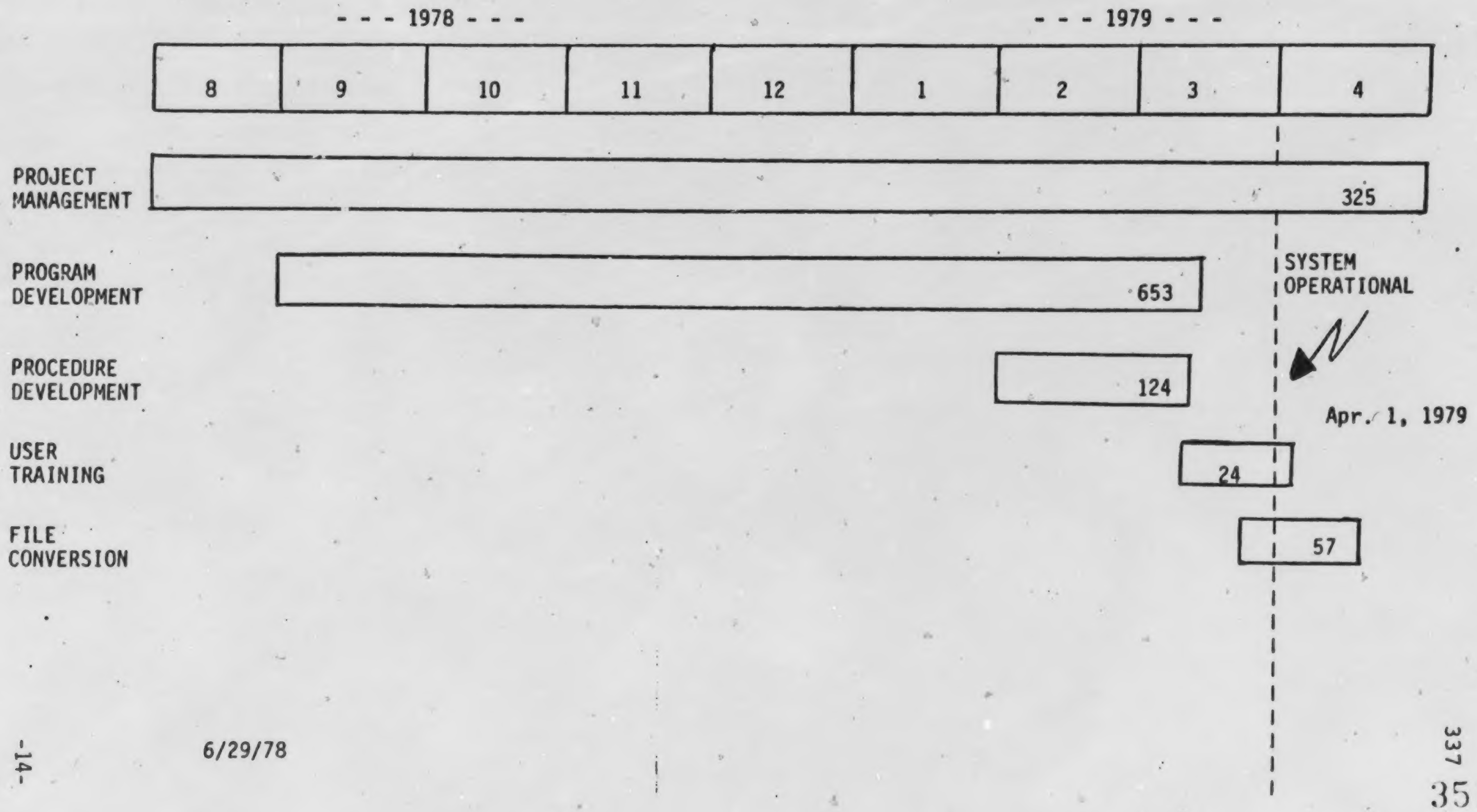
V. OPEN DISCUSSION

EXHIBIT 6

A F I S

PHASE III IMPLEMENTATION

FOUNDATION



6/29/78

EXHIBIT 7A

A F I S
PHASE III IMPLEMENTATION
ALUMNI

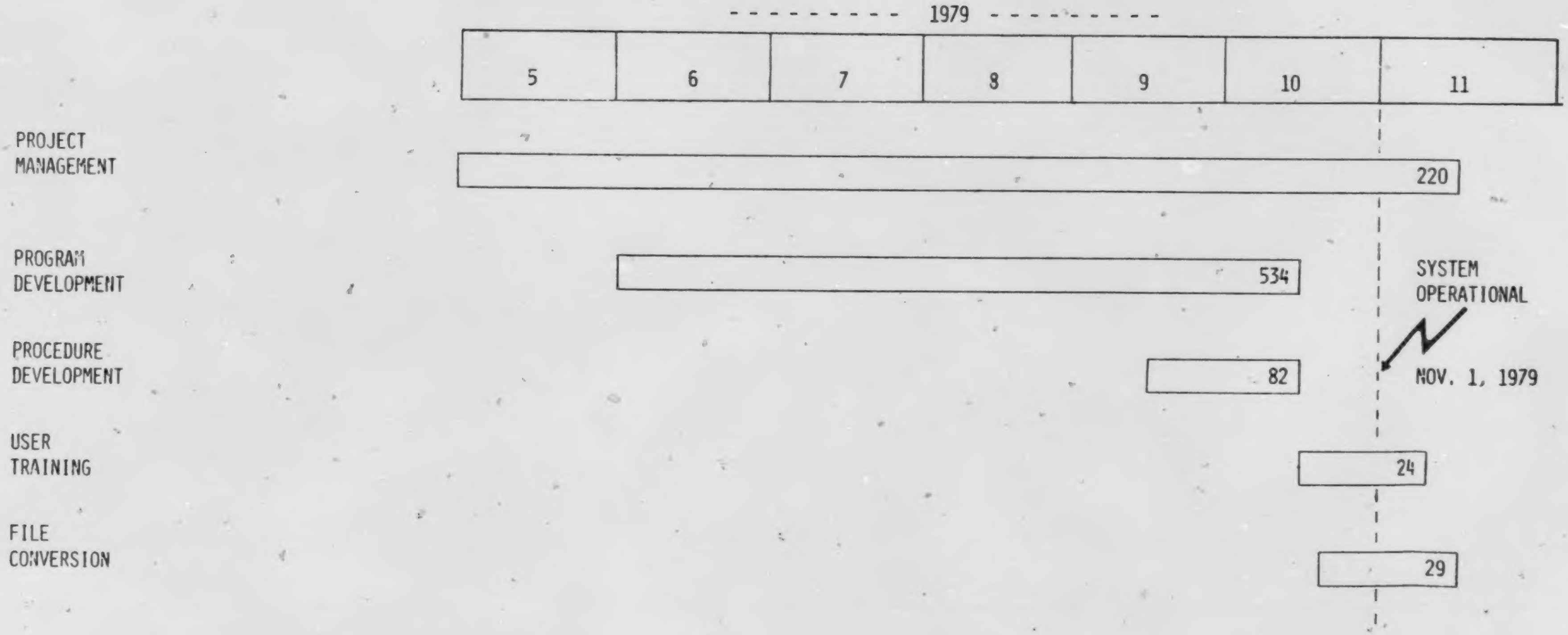


EXHIBIT 7B

personnel in the Data Base Administration group after the start of the implementation phase, it became necessary to prepare a new work schedule. At this time, the project leader became aware that at least some of the programming estimates were quite low. Utilizing a procedure our office had used before, many tasks were re-estimated, and a new schedule prepared. The completion date for the implementation of Part 1 shifted to July 1, 1979. (See Exhibit 8).

It seemed more logical to not rework the schedule for Part 2, until Part 1 was completed.

The formalized procedure for estimating the man-days required was adopted from the formulas described in an IBM manual on project management:[1]

$$\begin{array}{c}\text{program}\\\text{complexity}\end{array} \;X\; \left[\begin{array}{c}\text{programming}\\\text{know-how}\end{array} + \begin{array}{c}\text{programming}\\\text{job knowledge}\end{array}\right] = \begin{array}{c}\text{net program}\\\text{development}\\\text{time}\end{array}$$

$$\begin{array}{c}\text{net program}\\\text{development time}\end{array} + \begin{array}{c}\text{other}\\\text{system}\\\text{time}\end{array} + \begin{array}{c}\text{project}\\\text{loss}\\\text{factor}\end{array} + \begin{array}{c}\text{nonproject}\\\text{factor}\end{array} = \begin{array}{c}\text{total project}\\\text{development}\\\text{time}\end{array}$$

Prior to AFIS, revisions had been made to the program complexity weights, attempting to allow for the complexity of on-line IMS systems. Part 1 was estimated at 1171 man-days of effort. It actually required 1505 man-days, an additional 334 man-days of effort. Even procedural estimating techniques seem to rely on subjective judgments at some point. Two possible explanations of

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[1] Management Planning Guide for a Manual of Data Processing Standards, (IBM, GC20-1670-2, P. 12-19)

A F I S
PHASE III IMPLEMENTATION
FOUNDATION

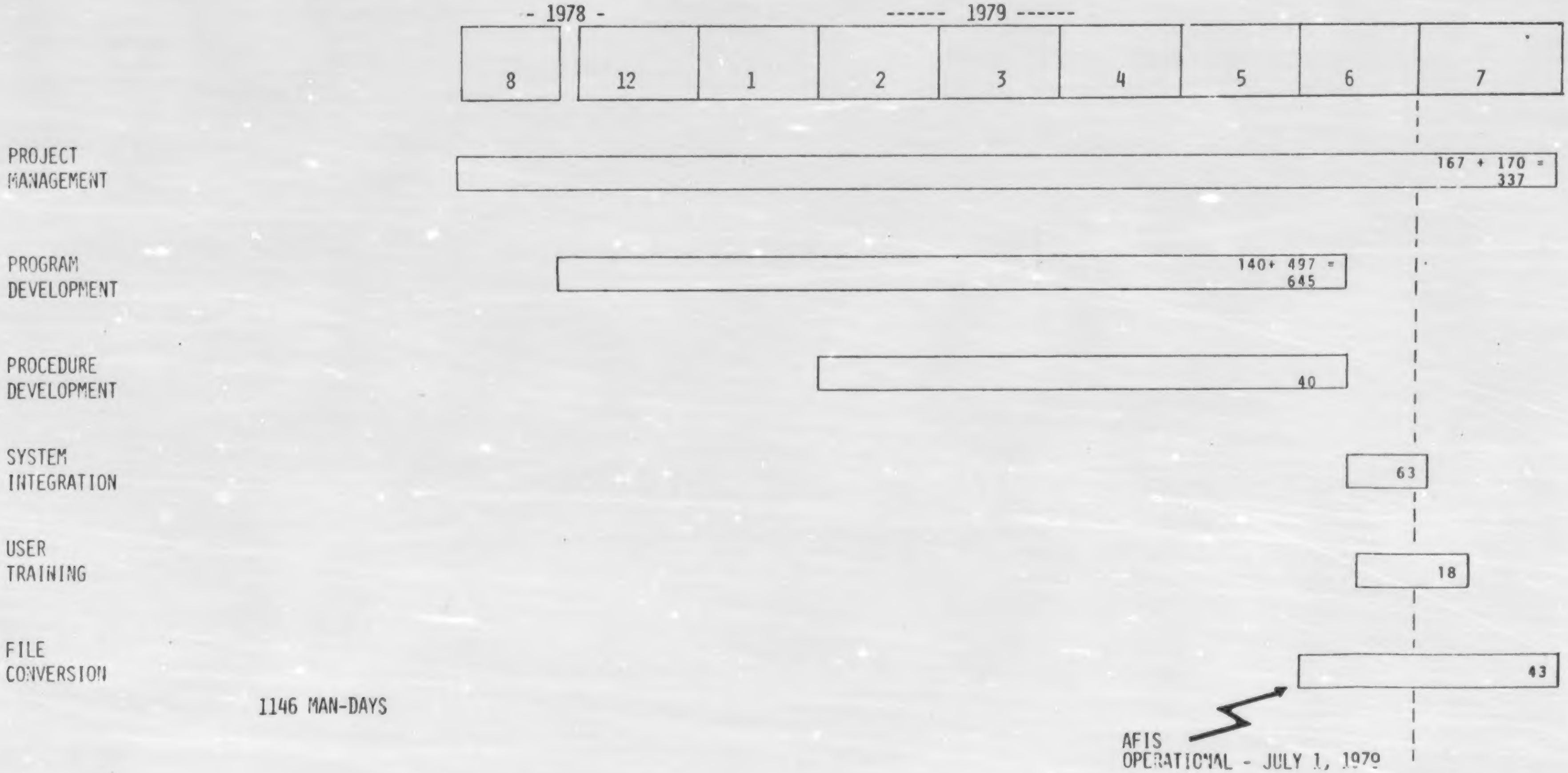

EXHIBIT 8

why the estimate was so low may be: the weighing factor was inadequate for the involved programming of AFIS, and/or some programmer/analysts' experience was over estimated. Current opinion is that the former was the major factor. Previous use of the estimating formulas had been applied for a system with on-line IMS programs averaging approximately 1,500 lines of code. In the AFIS system, one on-line program was over 5,000 lines of code and one batch IMS program was over 7,000 lines of code. Both of these exceeded our normal standards for manageable program length.

A formal estimating procedure is an important part of project management. Even if estimates are off, analysis after the project can be applied to improving the weighing factors.

WORK ASSIGNMENTS

Once tasks were estimated, work schedules for each team member were prepared by the project leader and team leaders together. Work schedules were laid out in calendar form for each person providing a work plan for the individual to follow, as well as providing a graphic tool for the project leader to redistribute work as necessary. Due to the errors in the estimates, this tool did not prove very useful during AFIS Part 1.

In order to help clarify the timing and responsibility for other than programming tasks, an AFIS activity chart was prepared and maintained. (See Exhibit 9A). In addition, a task responsibility list was prepared as in Exhibit 9B.

AFIS ACTIVITY CHART

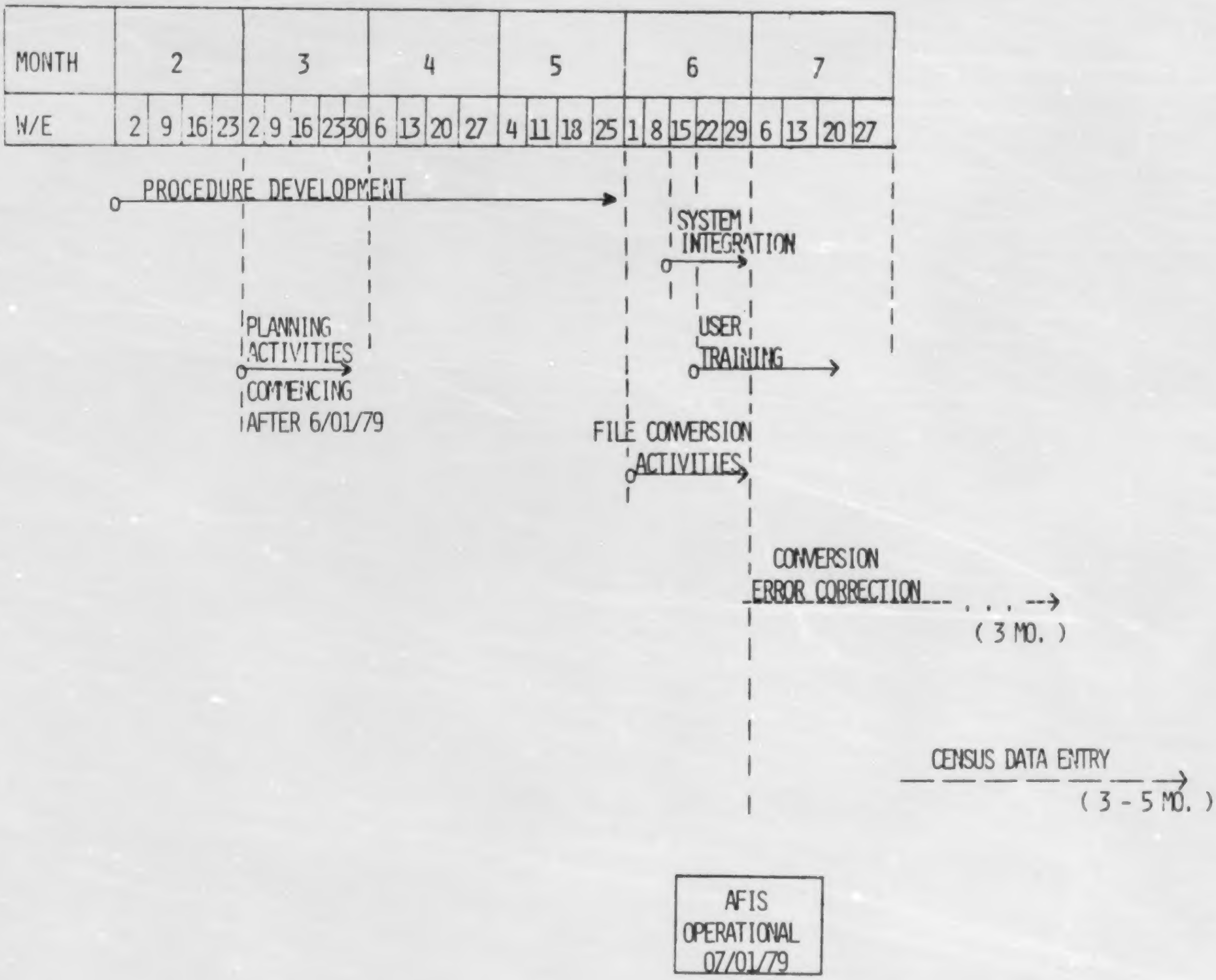

EXHIBIT 9A

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ACTIVITY - TASK	INDIVIDUALS INVOLVED	START DATE	COMPLETION DATE	COMMENT
FILE CONVERSION				
- REVIEW CONV. ERROR REPORTS	FOUNDATION	04/16/79	05/01/79	
- AGREE ON CONV. ERROR REPORT CHANGES	FOUNDATION & AISD	05/01/79	05/11/79	
- MAKE CHANGES TO CONV. PGM. & TEST	AISD	05/14/79	06/15/79	
- SYSTEM INTEGRATION TEST CONVERSION	AISD	06/15/79	06/16/79	
- PRODUCTION CONV.	AISD	06/29/79	07/01/79	
TRAINING OF RECORDS STAFF AND OTHER CLERICAL PEOPLE				
- COMPLETE AFIS DOCUMENTATION	FOUNDATION	02/01/79	06/15/79	
- AFIS OVERVIEW PRESENTATION	AISD & FOUNDATION RECORDS STAFF	--	06/18/79	
- DETAIL TRAINING	AISD & FOUNDATION RECORDS STAFF	06/19/79	06/21/79	

EXHIBIT 9B

COMMUNICATION MEMOS

There were two types of communication memos, both following the same format the consultants had used during the detail design phase. Each memo was numbered, and logged, and copies were distributed to all team members.

The first type was the standards bulletin, which provided on-going information on all standard procedures used in AFIS. Exhibit 10 shows a sample standards bulletin. The second type was the design change memo, which was used to inform the team of changes to the system specifications (Exhibit 11). The design change memo could be issued by any team member but required the project leader, team leader, and data base person's approvals.

These memos helped ensure that each team member received the same information. There was sometimes a problem with the amount of time it took to obtain approvals and have the memos distributed. But the advantages far outweighed any difficulties.

PROJECT STATUS REPORTING

There were three levels of project reporting. The individual time reports, summary time reports, and the steering committee progress reports together provided the major tracking facility for the project.

The individual daily time reports were prepared by each team member and submitted to the team leader weekly. (See Exhibit 12). Effort in hours was reported for each program or task. In addition, the programmer/analyst included the specific stage reached

SAMPLE

UNIVERSITY OF ILLINOIS

AFIS

STANDARDS BULLETIN

SUBJECT:	AFIS DATA ELEMENTS WITH 9'S COMPLEMENTED VALUES
DATE:	JUNE 29, 1979
PURPOSE:	TO LIST ALL 9'S COMPLEMENTED VALUES IN DATA FIELDS WITHIN SEGMENTS OF THE ALUMNI/DONOR DATA BASE (DGEALA).
DESCRIPTION:	ATTACHED IS A LIST OF 9'S COMPLEMENTED FIELD VALUES IN AFIS.

EXHIBIT 10

SAMPLE

AFIS

PHASE III

DESIGN CHANGE CONTROL SHEET

Design Change No. 136

PREPARED BY/DATE M. Maguire 04/13/79

SYSTEM FUNCTION AFFECTED:

PROGRAM (PROGRAM–UNIT) PGEA1000, PGEA5025

DATA BASE (FILE) (Foundation Batch Ticket, G/P Setup Audit Trail)

SEGMENT (RECORD)

DATA FIELD

STANDARDS BULLETIN/CHANGE SHEET

REASON FOR CHANGE:

Consistency in abbreviated values for "Matching Company"

DESCRIPTION OF CHANGE:

The Audit Trail record created by PGEA1000 and used by PGEA5025 should use a code of "C" for Audit-Trail-Batch-Type, Pic X(01), if the record was created from a matching company batch ticket.

EXHIBIT 11

ROUTE TO:

PERSON	APPROVED	PERSON	APPROVED
RJD	RJD		
STD	STD		
LLB	LLB		

TIME REPORT
NAME: PROGRAMMER/ANALYST 1
WEEK ENDING: 9/22/78

DESCRIPTION	TASK	S	M	T	W	T	F	S	TASK TO GO HOURS	COMMENT
PGEA7000	CODING		8	6	1		1		150	Clean Compile (25%)
PGEA1100	PDL			2	3	4	3		200	(10%)
NB STRING TEST	TESTING				4	4	4		10	

EXHIBIT 12

(coding, clean compile, tested, done) for each program and the percentage of the task completed by the end of the week. The data from these reports were the main input to the project status report. It is important that the time report be as painless as possible for the team members to fill out. The specific stage reached serves as the basis (along with total hours spent) for judgments concerning progress.

To help provide a consistent guide for choosing the percentage completed, percentages were assigned to various program stages of completion (see form #2 in the appendix). The percentage completed was a useful measure, but further review of the experience with Part 1 needs to be done to verify the reasonableness of currently prescribed percentages. Factors such as program size and complexity, type of program (on-line, batch), and programmer experience should be considered.

Running summaries of the weekly time reports were done by individual, by team effort and by project effort. The hours were divided by category of project management and programming. Form #3 in the appendix was used for each of these summaries. Team leaders prepared the team summaries, and the project leader the project summary. The individual summaries gave a continuing perspective of the team member's progress, helped identify progress problems, and provided a starting point for weekly reviews with team members on individual status. The other summaries gave a "bigger picture" of project progress and, at the end of the project, highlighted estimating weaknesses.

Once a month, a formal progress report was prepared for the steering committee; including man-hours expended, a list of tasks completed, and a list of tasks to be completed by the next reporting period. An agenda was prepared and a meeting held with the steering committee to review the progress report. (See Exhibit 13). The project leader chaired this meeting.

The steering committee status report and meeting was an excellent high level reporting mechanism. The monthly preparation assures review of the project status at frequent regular intervals. The level of detail reporting was good for a steering committee comprised of executives overseeing the project. This procedure forced the project manager to assess, evaluate, and explain the project status along with recommendations, if needed.

Russ Davies, the project leader, made these general comments, when reviewing the time reporting procedures used during Part 1:

1. Automation of summary effort reporting would have saved at least one-half man-days per week of team leader and project leader's time.
2. Effort should be summarized at the lowest level at which the summarized data would be meaningful and then passed up for review and use.
3. Effort reporting and summarization weekly and monthly is absolutely vital to assure continuing awareness of actual project progress.
4. A rough rule of thumb: if a budget overrun (individual or

AFIS

PROGRESS MEETING

AGENDA

MARCH 6, 1979

I. PROJECT STATUS

II. MAJOR TASKS COMPLETED

III. MAJOR TASKS FOR NEXT PERIOD

IV. POINTS FOR DISCUSSION

  A. AFIS DOCUMENTATION STANDARDS

  B. AFIS ACTIVITY CHART

  C. AFIS PROGRESS MEETING SCHEDULE

V. OPEN

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EXHIBIT 13

(PAGE 1 OF 4)

AFIS

PROGRESS MEETING

MARCH 6, 1979

I. PROJECT STATUS

	PHASE III FOUNDATION (PART 1)	
----- MAN - DAYS -----	2/2	3/2
BUDGETED	1171	1171
EXPENDED	551	690
BUDGETED REMAINING	620	481
ESTIMATED TO COMPLETE	633	520
(OVER) UNDER BUDGET	(13)	(39)
PROJECTED AHEAD (BEHIND) SCHEDULE	0	0

EXHIBIT 13

(PAGE 2 OF 4)

AFIS

PROGRESS MEETING

MARCH 6, 1979

II. MAJOR TASKS COMPLETED

A. CRITERIA VALIDATION MODULES TEST DATA GENERATION

B. TESTING COMPLETE FOR EXTRACT CRITERIA VALIDATE MAINLINE

C. TESTING EXTRACT REFERENCE DATA BASE MAINTENANCE

D. NIGHTLY BATCH MAINLINE COMPILED

E. . . .

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EXHIBIT 13

(PAGE 3 OF 4)

AFIS

PROGRESS MEETING

MARCH 6, 1979

III. MAJOR TASKS FOR NEXT PERIOD

A. TESTING CRITERIA VALIDATION MODULES

B. MAJOR TESTING COMPLETE FOR EXTRACT REFERENCE DATA BASE MAINTENANCE

C. PDL COMPLETE FOR GIFT/PLEDGE CHANGE AUDIT TRAIL

D. TESTING NIGHTLY BATCH MAINLINE

E. . . .

F. . . .

EXHIBIT 13

(PAGE 4 OF 4)

project cumulative) of seven to ten percent persists for the related reporting period beyond the point at which the overrun first occurred, then rescheduling or additional effort will be required to remain on schedule for the related unit of work. (Quantifying overbudgeted patterns is not an exact science.)

PROJECT DEVELOPMENT STANDARDS

The preliminary system design documents and the detail specifications produced during the detail design phase were the major inputs to the implementation phase. Our office has had an ongoing interest in productivity aids. We began with some development coding standards and have now progressed to a comprehensive structured programming methodology used in our large systems development. However, in establishing a methodology with the consultants, we compromised on what would constitute detail design specifications. The result was a combination between the use of program structure charts and a HIPO (Hierarchical Input Process Output) description of a program. The level to which modules were defined, and the amount of structured concepts applied to the module descriptions varied with each analyst.

The development programming guidelines document[1] used by the AFIS project team includes guidelines for -

1. program structure charts -- a diagram representing the relationship between modules in terms of partitioning,

---

[1] developed and maintained in-house

organization, and communications (data and control).[1]

2. program design language (PDL) -- combination of ordinary English narrative with a few simple logic elements, "shorthand" form of coding.[2]
3. COBOL coding -- structured coding standards (including specific IMS coding guidelines).
4. walk-throughs -- formal review of a product to insure completeness and accuracy.[2]

Although the detail design specifications included documentation to the structure chart level, the implementation team frequently had to rework the structure chart to improve program design. The narrative program description did not always adhere to the structured coding guidelines, which sometimes required the programmer/analyst to rethink the structure of the program. (These factors undoubtedly contributed to the estimating error).

For large programs, program design language versions were prepared before progressing to actual code. Walk-throughs were used at the clean compile stage. Team leaders would decide when walk-throughs were necessary for program design language versions. Team members taking part in the walk-throughs completed a form (#4 in the appendix) to track completion of the walk-through requirement and team participation.

[1] Yourdon and Constantine, Structured Design, Yourdon, Inc., 1976.

[2] Productivity Aids and Project Management In An IMS System Development Effort, Proceedings of the 1976 CAUSE National Conference (Orlando, Florida: 1976).

Reviews by the team leaders were required for test plans and test output results. (Written test plans were required before testing began). These reviews were to verify the expected results on a unit program basis.

Since the Data Base Administration group is concerned with efficient use of IMS, several stages of a particular program were submitted for review to the Data Base Administration liaison person, who would decide to do a thorough review, a cursory review, or no review at all. By using form #5 in the appendix, the team member obtained a formal response when his material was returned. In cases where the team leader or team member was concerned as to whether appropriate data base calling structures had been coded, the "comprehensive review requested" box on the form was checked, thereby specifically requesting a thorough review.

Once program unit testing was completed, string tests of related programs were run to verify correct interfacing of those programs. The final tests conducted were business function tests which were set up from the Foundation business procedures viewpoint. The tests began with on-line data entry, and progressed to the batch processing which resulted in the hard copy output. This test was the final run before production implementation, and was closely reviewed by the user liaison.

CONCLUSION

As noted before, Part 1 of AFIS became a production system on August 3, 1979. Some statistics from the implementation of Part 1 of AFIS are:

- Nine on-line programs
- 13 batch programs
- 23 additional modules called by other programs
- 74 MARK IV requests
- 49 reports
- 57,654 lines of code (does not include MARK IV)
- Four of the on-line programs had over 3,000 lines of code each
- 1,505 man-days of effort
- Five data bases occupying 300 cylinders of 3350 disk space
- Seven 3270 series display terminals, two printers

As of mid-November, the system has had one abnormally ending situation. There have been one serious and three minor situations where the system does not function as specified.

Considering the complexity of the AFIS system, and the inexperience with an IMS system of most of the programmer/analysts, the implementation went very well. The success of this project can not be contributed to the project management scheme alone. The amount of overtime people were willing to commit to AFIS indicates a high level of personal commitment on the part of many team members.

Toward the end of the project, the South team leader responsibilites consumed far too much of the project leader's time, making it difficult to maintain proper review of the project progress. In a large project, a project leader cannot fulfill his project control responsibilities and those of a team leader as well. But a great deal has been learned about what assistance good project management techniques are to the implementation of a project. And by reviewing the records maintained during this implementation, improvements can be made in estimating, planning and communicating -- all of which will make the plan for Part 2 more accurate and reasonable, and the implementation more smooth.

APPENDIX

AFIS PROJECT FORMS

#1. DESIGN CHANGE CONTROL SHEET

#2. PROGRAM UNIT IMPLEMENTATION CHECKLIST

#3. ACTIVITY CHART

#4. PROGRAM WALK-THROUGH SIGN-OFF SHEET

#5. DBA REVIEW SIGN-OFF SHEET

Design Change No._____

AFIS

PHASE III

DESIGN CHANGE CONTROL SHEET

PREPARED BY/DATE ____________________

SYSTEM FUNCTION AFFECTED:

PROGRAM (PROGRAM–UNIT) ____________________

DATA BASE (FILE) ____________________

SEGMENT (RECORD) ____________________

DATA FIELD ____________________

STANDARDS BULLETIN/CHANGE SHEET ____________________

REASON FOR CHANGE:

DESCRIPTION OF CHANGE:

ROUTE TO:

PERSON	APPROVED	PERSON	APPROVED

FORM 1

UNIVERSITY OF ILLINOIS

AFIS

PROGRAM-UNIT IMPLEMENTATION STEP CHECKLIST

PROGRAM NAME ______________________________ ID __________

PROGRAM-UNIT NAME ______________________________ ID __________

% COMPLETE	IMPLEMENTATION STEP		DATE COMPLETED
	PDL	(If Applicable)	
	PDL DBA Review Sign-Off	(If Applicable)	
20	PDL Review (Team Leader or Walk-Thru)	(If Applicable)	
25(W/O PDL) 35(With PDL)	Source Code		
	Keypunch		
	Clean Compile		
	Clean Compile DBA Review Sign-Off		
50	Clean Compile Walk-Thru Sign-Off		
	Test Plan		
	Test Plan Review (Team Leader)		
	Test Plan Review (DBA)		
75	Test Data Generation		
	BTS Test		
	BTS Test Review (Team Leader or Project Mgr)		
	BTS Test Review (DBA)		
100	"Live" Test		

PROGRAMMER ______________________

TEAM LEADER SIGN-OFF/DATE _____/_____

RJD
8/78

FORM 2

ACTIVITY: ______________________ PROGRAMMER: ______________________

WEEK NO.	WEEK ENDING	ORIGINAL			EXPENDED HOURS			% COMPLETE		HOURS TO GO			TIME AHEAD (BEHIND)		
		HOURS	TARGET DATE		THIS WEEK	TO DATE		TO DATE		BUDGET	ESTIMATE		HOURS	ELAPSED DAYS	

FORM 3

UNIVERSITY OF ILLINOIS

AFIS

PROGRAM WALK-THRU SIGN-OFF SHEET

☐ PDL WALK-THRU

☐ CLEAN COMPILE WALK-THRU

PROGRAM NAME ______________________

____

PROGRAM ID ______________________

WALK-THRU PARTICIPANT		SIGN-OFF	SIGN-OFF DATE
PROGRAM DEVELOPER:			
MODERATOR:			
REVIEWER:			
REVIEWER:			

COMMENT(S):

364

DATE RECIEVED/COMPLETED ________ / ________

SUBMITTED BY/DATE ________ / ________

UNIVERSITY OF ILLINOIS

AFIS

DBA REVIEW SIGN-OFF SHEET

☐ COMPREHENSIVE REVIEW REQUESTED

☐ PROGRAM SPECIFICATION

PROGRAM NAME ____________________

____

☐ PDL

☐ CLEAN COMPILE

☐ TEST PLAN

PROGRAM ID ____________________

☐ BTS TEST

DBA REVIEWER(S)	SIGN-OFF	SIGN-OFF DATE
	________	________

ROUTE ANY CHANGES BACK TO DBA REVIEWER(S):

☐ NO

☐ YES

COMMENT(S):

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FORM 5

THE NEW DATA MANAGER

Dr. William A. Rodgers

Eastern Michigan University

Ypsilanti, Michigan 48197

THE NEW DATA MANAGER tries to introduce the concept of "putting the data back into the hands of the manager". For the past decade, higher educational institutions and the business community have been grappling with the idea of Management Information Systems. To date, there is no single Management Information System that solves the problems for the mundane user in the individual offices of an organization.

THE NEW DATA MANAGER explains the invention of a software system in the development of a Management Information System. To the organization this provides a viable alternative to the massive Management Information Systems available from IBM and other large computer vendors. It relies highly on the non-computer experts in using commands of the English language.

Over the past 20 years, computing has been a part of everyones' work life. Management data which people use in their offices has been moved to a central clearing center with large computers. There, technical personnel are needed to retrieve and process decision-making information. With the invention of PROFILE-90 and similar types of inquiry, retrieval, and reporting systems, the Management Information Systems promised in the 1960's are now beginning to take shape in a form that the user can understand. THE NEW DATA MANAGER is an exposition of at least one system which can do it now in a quick and easy manner.

THE NEW DATA MANAGER

I. INTRODUCTION

This paper is an attempt to introduce a new concept into the Data Processing Community -- that of THE NEW DATA MANAGER.

In the past, organization growth compelled Information Systems and their development to move from action front offices where the workers had a "feel" for the data to centralized systems for storage and access. This central repository was usually computerized and only the staff of the computer or information center had the requisite skills to design, inspect or report from the data files.

In essence, the data was removed from the individual office and a technical barrier was placed between the user and his data. In order to inspect his data, the user had to work through a technical intermediary. As a result, all information systems were now turned over to technicians or project teams headed by technicians. Knowledge is power and thus the technocrats became the vocal voice or chairman of the various information processing committees or Task Forces.

Because of the repetitiveness of the task, the need for control, for security, and the expense of the equipment and professional personnel, the need to centralize was justified. Also, because the technology at that time was most conducive to a centralized batch processing operation, there was little need for the data to be scattered around in the various offices where a tremendous amount of personnel effort was needed to bring the data together for management decision-making.

In today's state-of-the-art this is no longer a correct assumption. Past data processing generated such concepts as Management Systems with highly trained technicians such as Data Base Administrators. While Management Information Systems (MIS) were clearly the goal, most systems developed fell short of their goal and only Transactional Systems (TIS) were made operational. Of course, some Transactional Systems with elaborate output reports did seem like MIS, but usually they provided only mundane reports or information which the Senior Administrators had to synthesize into decisions for the organization.

Thus, there is a need for a new type of person. This "new" type of person is the only one in the organization who can help "grow" MIS. In order to accomplish the new role, he has to have easy access to the data and be capable with little or no technical training or background to develop information systems for his own office and the organization as a whole. With interactive computers and English-like languages for storage, retrieval and reporting systems, the data can now be moved back to the manager "where the action is".

This paper is intended to introduce the data processing user to a new concept called the DATA MANAGER. Essentially, the DATA MANAGER'S are the people who presently exist in the offices of an organization collecting, controlling and reporting from data in their particular operation as it relates to the total operation of the organization. We consider this a new type of person because the DATA MANAGER not only will be disciplined in his area of knowledge, but will have the support of computerized information such entry, retrieval, and reporting at his own location rather than submitting source documents to a centralized location. Thus, he has to be skilled in "data entry", "programming", "operations", and "systems design". (The quotes are to indicate Quasi-skills or expertise, not advanced professional and technical training.)

The new DATA MANAGER will use ad hoc or heuristic development techniques to evolve systems and subsystems which will clearly do the things "he" wishes rather than what the "technicians think" he wishes. Of course, a cadre of computer center technicians will still be needed, but their roles will change as more of the things a Data Manager wants to do with the data will be done by the end user or DATA MANAGER. In time, systems including input, edit, control, security and reports will take place with the DATA MANAGER who really has a feel for the data.

II. PROFILE-90

The PROFILE-90 system, originally called SCOPE, was designed three years ago by Dr. William A. Rodgers at Eastern Michigan University after nearly a decade of research on information entry and retrieval system. It was programmed by Chuck Krapf of the University Computing Department at Eastern Michigan University.

PROFILE-90 immediately found widespread use at Eastern Michigan University by both the Academic and Administrative communities. Administrators have been pleased to discover that with PROFILE-90 they now have direct control over their data without having to go through the Computer Center staff. The following is a partial list of offices currently using PROFILE-90 and DPL:

- Admissions
- Foster Parent Training
- Budget Planning
- Personnel
- Staff Benefits
- Alumni
- Development
- Graduate Records
  - -- Degree File
- Undergraduate Records
  - -- Degree File
- Bilingual Project
- Accounting
- Financial Aids
- Institutional Research
- Budget
- University Computing
- Many Academic Departments

Users have found that previously complicated and time-consuming data base manipulations can be done easily and quickly by managers and secretaries without any computer experience. They can design a screen format, enter information into a data file, sort the file in any desired order, search for and display and record in the file, and create a listing of any subset of the file.

PROFILE-90 offers many features for maintaining data security and integrity. Each time a record is inserted, changed or deleted, an entry is made into an audit file that shows who made the change and what information was changed. Files can be protected with two levels of encryption. The first level encrypts the data in the file so that only users that know the encryption key can access any data in the file. Even with the encryption keys, some data fields can be hidden from view or protected against modification. A second key is needed to access information in these protected fields.

The system has been so successful that it has been purchased by a software house out of Chicago and will be sold on the open market as PROFILE-90.

Besides being data independent, PROFILE-90 files are now compatible with National Information Systems Data Base Labguage DPL, a relational data base system. The combination of PROFILE-90 and Data Base Systems has proved to be extremely flexible and powerful data base manipulation system.

III. Examples

A sample file and screen will be created and used sharing such things as logging in, building a screen, creating a DED or MAP, entering data, etc. Additionally, seven systems will be demonstrated to show the ease of using PROFILE-90 and the compatibility with DPL. The seven systems are:

1) Phone Calls
2) Mailing Labels
3) Form Letters
4) Checkbook
5) Printer Utility
6) Purchase Order System
7) Advanced Techniques

A brief explanation of the seven systems is as follows:

1) Phone Call System -- This is a screen display of the green phone message form located in all offices. Instead of the secretary writing the message on the form, it could be typed on the screen. The power of PROFILE-90 could then be used to manipulate the information.

2) Mailing Labels -- Offices are constantly making requests from the Computer Center for gummed labels. Many dollars are expended in producing this needed service. A mailing label system has been designed using PROFILE-90 and DPL which will allow one to get lists or labels on any file available at University Computing or information files held only in their own offices.

3) Form Letter -- Coupled with names and addresses for label processing a form letter can be typed which will print the heading information from the address file and insert a form letter.

4) Checkbook -- This is a usable system to keep one's checkbook. A compatible DPL program to balance the checkbook or prepare summary statements is also presented.

5) Printer Utility -- This is a utility program to form feed the typewriter terminals.

6) Purchase Order System -- All offices issue a requisition to obtain equipment, services, and supplies. The requisition is sent to the Purchasing Office who then issues a Purchase Order and sends a copy to the requesting office. When the item is received by Central Receiving a Receiver is sent along with the item to the requesting office. The purpose of the PROFILE-90 Purchase Order System is to keep track of this flow.

7) Advanced Techniques -- There are several advanced techniques which will be demonstrated such as Program Function Keys, Extract, and Encryption.

The following procedures indicate the steps to execute the seven systems listed previously:

1) Phone Calls --

```
RUN PROF90
PHONE.DAT
PHONE.CMD
```

2) Mailing Labels --

```
DO CONTN CONTN
R DPL
CONTN
OPEN CONTN
DO LABEL
```

3) Form Letter --

```
R DPL
CONTN
OPEN CONTN
DO LETTER
```

4) Checkbook --

```
DO CHECKN CHECKS, CHECK
R DPL
CHECK
OPEN CHECKS
DO SUPER
BALANCE
ENTER SET NAME -- CHECKS
CHECK
STATEMENT (HARD COPY)
DONE
EXIT
```

5) Printer Utility --

```
R UTL:PRINTR
STATMNT.DAT
```

6) Purchase Order System --

Only Requisitions and Receivers are input as Purchase Orders have the same information as Requisitions and the P.O. Numbers are carried on the Requisitions.

Program Function Examples:

In Command Mode use PROG
In EDIT Mode us ↑K

A. DO PO

B. To scan through file

1. PROG
2. PF1 KEY
   ↑E (always begin with ↑E)
   NEXT - Return
   EDIT - Return
   ↑E
   NEXT - Return
   EDIT - Return
3. ↑Z To execute - NEXT, EDIT, PF1
4. Then get a record and type in EDIT to begin use of PF keys.
5. End scan with a ↑E (NOTE: If you make an error, use UNDO to correct.)

C. To SORT file on first field:

1. PROG
2. PF 2 KEY
   ↑E
   REWIND - Return
   SORT - Return
   1
   ↑E
   REWIND - Return
   NEXT - Return
3. ↑Z
4. To execute NEXT
   EDIT
   PF2

7) Advanced Techniques -- Encryption and Extract

- A. DO SENCRP CHECKN,,WAR - Non Priv.
  DO SENCRP CHECKN,,,WAR - Priv.
- B. Encryption Only
  DOCKENCR JUNE,CHECKN,WAR
  - 1. No Encryption
    Case 1 DPL, Boxes, Go
  - 2. Original Encryption
    Case 2 Nothing encrypted all fields available: same as A above except only one screen necessary to access, protect and hidden fields.
    E.DAT
    E.CMD
    ENC
    Pas. Blank
    Priv. Blank
  - 3. Change Passwords by use of TRANS Option
    Case 3 TRANS - to encrypt screen for hidden and protected fields.
    Pas: Blank
    NEW PAS: WAR — Screen encrypted H & P available.
    New Priv: — Data unencrypted

    Case 4 TRANS - to encrypt data and not screen - hidden and protected fields not available.
    Pas: WAR
    New Pas: — Screen encypted
    New Priv: WAR — Data encrypted screen unencrypted but gives Pas = WAR and H & P fields available.

    Case 5 To edit CMD use TRANS or Double Password
    TRANS
    EDT
    Pas
    New Pas:
    New Priv: WAR — No Priv to edit.

```
Case 6     TRANS
           EDT
           Pas:  WAR
           New Pas:  WAR
           New Priv:
```

TRACK III
USE OF INFORMATION SYSTEMS

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A LOOK AT INFORMATION PROCESSING OF THE 80's

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CHANGE is probably the most often word used in the data-processing community today. In the last twenty years computer technology accelerated at an exponential rate. Development and progress in the computer industry can only be compared to man's exploration of space in the seventies, again, due greatly to man's ability to successfully use the computer as a problem solving tool. Even more startling is that even with the tremendous increase in technology, the cost of the computer today is a mere fraction of what it was ten years ago. However, the cost of providing data processing to an organization has skyrocked out of control.

Today, as we gaze into the eighties we find that data processing has become an extremely complex and expensive way of life. To change a simple report may sometimes be an impossible task; to develope a complete information processing system an impossible dream. The major cause of the phenomenon is the success of the computer itself. The proliferation of computers has created a people problem. There are not enough competent qualified people to cover all the computers, and satisfy the needs of our users.

The solution is to use software designed to substantially reduce the costs, time frame and risks associated with information processing systems. To achieve this we must maximize the productivity of our greatest asset, our people. Yet no matter how efficient we become, we still will be unable to always react to our users needs in a timely fashion. There is only one solution to this problem. Put the data and the ability to change it, report it and control it back into the hands of the users themselves. Only our users can fill the gap that our success with the computer has created. The programmers of the Eighties will be functioning as systems architects, designers and modeling consultants. By the nineties programming as we know it today will cease to exist.

The changes we will go through in the Eighties will make the changes and conversions of the past ten years seem like child's play.

Controlling the ever increasing cost of data processing is paramount in the mind of the todays data processing executive. Industry predictions concerning both the growth and associated costs of data processing have historically been on the low side when compared to the actual cost of operating a shop today. On the other side of the environment, hardware manufactures continue to announce new low priced machines featuring state of the art technology on a daily basis. Progress in improving the cost/performance ratio of hardware and software configurations has been dramatic, and the total growth of the industry in terms of annual expenditure in the hardware/software market place is impressive. Yet improvements in areas such as programmer productivity and end user interaction with the computer are not keeping pace with other developments. If data processing continues to grow, as we all know it will, it will begin to suffer from the gaps created by the human element factor or lack of enough people to do the job.

Studies indicate that there is a real problem facing the data processing organization today and in the future. The problem is a shortage of competant, well trained, qualified people required to keep up with the ever increasing demand for information.

Many of the problems we suffer from today can be traced back to the sixties where record processing originated.

A record or a specific transaction along with all its pertenent data was captured and stored on cards and then tape for later processing. It was also at this point in time that data processing emerged as a potential information processing department for an organization. The computer department had stored in its "limitless banks" of data all the normal financial and working information of the company. The early user of the computer was promised immediate response to his request, and an endless supply of accurate reports about his departments information. The reader may also note that it was at this time data processing took the control of information away from the end user. Whether it was right or wrong does not matter. For the times, it was the correct methodology; and the way in which data was stored and processed was controlled by the technology of that era.

As we all know, early records or data were stored on tapes. Multiple tapes were sorted and merged to allow viewing information in different ways. Computer languages such as RPG were used to develope programs and systems to solve the problems of running a business at that time. After enjoying a brief period of success with their first efforts of data processing, early pioneers begain to convert their tape driven systems to take advantage of new advancements in operating systems, hardware design and rapid access storage devices. Shortly after that period, new languages appeared on the scene and once again technology beckoned. Old RPG programs were converted to high-level languages such as COBOL to allow the programmers of that time to create integrated systems solving a family of applications. As a side line changes to existing programs and reports were promised in a much more timely fashion.

The next period in the cycle was the creation of the term Management Information System. It was during this time that the data processing organization became an extremely powerful department. Shop size in terms of hardware, systems, and personnel expanded rapidly. Soon terminals appeared, allowing very rapid access to controlled data. Programming, systems development, and operating systems became extremely complex and the time consuming task of maintenance began to chew away at the dwindling supply of available programmer time.

Fortunatly, many saw a need to separate programs from data and create integrated batch and on-line systems using one repository of information or DATA BASE. The data base era of the seventies coupled with the ever increasing number of terminals allowed faster access to changing information. Data Base technology reduced maintenance substantially and allowed the programmers to react in a timely fashion to new requirements and to make changes in existing systems. With the appearance of very high level report writers and users were promised almost instant access to information. All one need do was make a request to the dwindling number of computer professionals available to do the job.

The success of the industry was a problem in itself. The proliferation of computers had created a people gap. The supply of human resource could not keep up with demand. IBM's

Delphi Study provides an excellent indication of the history and expected growth of the DP industry in terms of the introduction of new computer application areas and associated resources. The study indicates that it will be necessary to double the value of todays installed hardware base, if 75 percent of the current computer users implemented 94 percent of the applications contained in the study by 1985. If we compare that with the United States Computer/Programmer Census, (Attachment A) which projects 1.9 programmers per general computer by 1985, we will find that the real limitations of the future will be the lack of qualified Data Processing professionals to support existing systems and implement new ones. With the diminishing number of DP professionals that will be available to address tomorrows problems, the area of programmer productivity becomes the critical path in any organizations information processing PERT chart. Programmer productivity could very well be a potential bottleneck to the future growth of data processing.

Currently, end users require a computer professional to TRANSLATE their requests into computer usable instructions. Clearly as the number of end users increase and the number of computer professionals decrease, we have a catastrophy in the making.

The actual role of data processing is one of TRANSLATION No matter how sophisticated our methods or number of successes, data processing is still the middle man. Data processing must always be involved with the current level of information retrievels.

If data processing is to succeed, it must maximize the productivity of all its users, both data processing and non-data processing alike. Retrievels must match users. All users need to have an efficient means of communicating with the systems of the future. Since there will be fewer DP professionals, we must obtain maximum productivity from the ones we have. In addition, end users who are increasing exponentially need a compatible method as well. All users must be able to:

- Use Familiar Languages
- View Data Logically
- Retrieve Information
- Update Information

At the same time, in order for the Data Processing Executive to control and predict his budget with accuracy, complete environmental independence is required in the areas of hardware, data base, and end users.

Therefore, the CHALLENGE OF THE 80's is to achieve Direct End User Interaction and Complete Environmental Independence. The solution is a TOTAL INFORMATION SYSTEM.

To overcome the software gap and once again satisfy the needs of users, data processing needs a system that:

- Organizes data structures so that end-user information needs dictate the data organization rather than vice versa.

- Provides rapid response to all information requests by allowing end users direct interaction with the computer whenever possible.

To meet its own need, data processing requires that the system have multiple levels of independence to assure that the software is not only portable today, but is positioned to take advantage of future technological developments. Only then can the data processing professional be assured that his investment in software is fully protected.

TIS, the Total Information System, the next generation of software, achieves these goals by providing the most responsive systems software available.

An information system responsive to the requirements of an organization implies increased data processing responsibilities. Data must be physically structured to reflect the information need; rapid access to the data must be provided through interactive, user-oriented systems; change within the organization and technological evolution must be effectively managed and above all there must be adequate controls.

TIS, enables data processing to accept these responsibilities by employing the concept of Logical Views. A Logical View represents a collection of data items that can be manipulated by a specific user or users.

In practice, a Logical View represents the outer limits of a user view of data items. The user will normally choose to work with some of those data items (selection), under certain conditions (logic) and in a certain format (output). The combination of selection, logic and output criteria represents a Finite Logical View (FLV). The FLV is a specific, logical request for information. The TIS analyses performed prior to establishing the FLV ensure that all activities are permissible. There is no physical location determination of the requested information. A Finite Logical View is, therefore, completely independent of the data base environment. Subsequent translation and extraction of the appropriate data items and alignment in the requested format takes place internally.

A Finite Logical View can be stored in the Directory for subsequent re-execution. Since it is independent of the physical location and structure of the data, data items can be moved within data records, data sets and, in a distributed environment, across data bases with no impact on these logical requests. Indeed, the Logical View concept allows all users of TIS software to be completely independent of change.

Although it is the Logical View that allows the user to independently interact with the data base, it is the Directory that represents the central point of control for all components of TIS. Whether the facilities are end-user oriented (languages) or more aligned to the needs of data processing (data definition), the Directory acts as the single, integration point. The Directory contains: the inventory of data items; the Logical Views; the Finite Logical Views; the location of all data items; stored messages; security and privacy criteria;

the information system descriptors; physical environment descriptors and the attributes of the data items.

Info - Design requires that all organizational data is identified, categorized and analyzed. Each of these processes requires the skills of a responsible individual, or team, within the data processing department. . . the Information Systems Coordinator/s (ISC).

While not difficult or overly complex, the ISC function is important. It is the responsibility of the ISC to ensure that the Directory is correctly created and maintained at the required status level.

Building a TIS Directory: In creating the Directory, the Logical View concept requires establishing the context in which an organization views data. This is accomplished by use of TIS Info-Design.

Identifying Data - Business decisions depend on information; data viewed in context. Data is the most valuable resource of an organization. As such it must be rigorously controlled and managed. In order to achieve the required level of control and management, organizational data must be identified.

Once identified, a specific item is assigned characteristics which establish its unique nature. Such characteristics as allocation of a unique name, length and edit characteristics are required. A description, default value and defalut columnar headings (for query or report) may optionally be assigned to further qualify the data item in the Directory.

Categorizing Data - Data usage within an organization varies by individual. And, the individual's data usage also varies depending on the needs of the moment.

A responsive information system must be cognizant of the information needs of an organization. Not only what is required, but how it is required, how often, and at what intervals.

In an organizational hierarchy, information needs vary at different levels. At the lowest level (the department) the information needs require only data belonging to that specific department. There is little or no cross-department interaction. At the next higher level in the organization, a management view transcends departmental boundaries.

The higher the level in an organization, the more data that must be made available. Not only must more data be available, but the way in which it is used will often vary. For instance, at the lower levels of management, it is performance on a week-to-week basis that is important. At a higher level, where corporate planning is being undertaken, it is annual performance that is more significant. Same data, but different viewpoint.

TIS Info-Design offers techniques that assist the ISC in identifying the context in which data is viewed by all levels of an organization. This is essential to building a responsive information system.

Analyzing Data - Establishing Logical Views for an organization enables the ISC to identify which data items have the highest and the lowest usage. This is a fundamental step in establishing an information system. However, since information is data viewed in context, the ISC must consider not only the usage of data items across Logical Views, but also their interaction within Logical Views.

It may well be that within an organization, certain data items are always viewed together whatever the level of decision-making. Other items are always viewed discretely and never have more than a one-for-one relationship with other data items.

TIS Info-Design permits the ISC to perform both levels of analysis. The resulting analyses allow the ISC to construct a Logical Model of the data structures required to satisfy the information needs of the organization.

Selection of a Data Base Management System to physically implement the Logical Model is the next step.

Establishing a physical data base is an essential step in the creation of an interactive information system. With data base, data is stored consistently with a minimum of redundancy, facilitating both control and access.

TIS is designed independent of the data structure and Data Base Management Systems. This independence permits selection of the technique best suited to the specific information needs of an organization, as identified through Info-Design. Traditionally, data base management has been accomplished by using one of three standard structuring techniques. These techniques. . . network, hierarchical and inverted list. . .

have forced data processing to select a Data Base Management System that comes closet to satisfying the needs of their specific organizations. The data base decision, therefore, is often a compromise.

Differing information needs dicate variable data structures. No one structure is ideal. Hierarchies are valid in one instance; yet networks are more suited to another.

TIS has been designed to be independent of standard data base structuring techniques. It has also been designed to allow migration to the implementation of new data management concepts.

Relational techniques and distributed data base are two manifestations of these opportunities.

TIS allows data processing to accept these flexible, new techniques without impact upon existing applications. TIS is completely independent of the data base environment, allowing implementation of the technique or techniques that best satisfy the needs of an organization.

To ensure that all levels of users remain independent of the data base environment, it is required that the TIS function managers are used to access the data. The TIS function managers represented by the Generalized Data Base Maintenance, Interactive Procedures, and by the Retrievals, utilize the unique Logical View concept. The concept allows data processing to take full advantage of any technological change that improves the responsiveness of the information system. . . distributed data base, realigned data sets or even a new technique for data management. The concept also permits data processing to be responsive to changes in organizational needs.

One of the strengths of the TIS concept is that it provides end users direct, yet controlled access to the information the computer contains. End users are not limited to On-Line Query using video displays and/or hard copy terminals, but can also generate simple reports through the Batch Query facility.

No existing system puts as much information at the fingertips of the end users as TIS On-Line Query. By employing a user-friendly language, with familiar words, phrases, syntax and grammer, TIS eliminates the need for end users to understand existing high level programming languages. Most end users have neither the ability nor the desire to understand such complex programming tools as COBOL, PASCAL and FORTRAN.

Showing many of the characteristics of artificial intelligence, TIS On-Line Query allows end users to request information in free-form natural language.

> PRINT STUDENT, STUDENT-MAJOR AND TOTAL OF ALL COURSE HOURS TIMES COST IF GRADE POINT AVERAGE IS EQUAL TO OR GREATER THAN 3.5 AND FINANCIAL-AID EQUAL YES AND WHEN FINISHED PRINT TOTAL AND AVERAGE OF ALL COURSE HOURS TIMES COST.

If the user makes a mistake, such as trying to access data outside his or her Logical View or simply misspelling a word, the query will enter into a dialogue with the user attempting to correct the error. When the request satisfies all criteria, the information is displayed:

```
10:20 A.M.     NOVEMBER 28, 1979

                       STUDENT            COURSE HOURS
STUDENT                 MAJOR              TIMES COST

498-46-1436           NUCULAR                9,000
571-15-1341           SOLAR                  8,000
520-52-1051           SOLAR                  8,500
487-15-3123           ELECTRICAL             7,000
503-19-2121           NUCULAR                7,500

TOTAL                                       40,000
AVERAGE                                      8,000
```

Headings are automatically aligned in columnar format. Lines that exceed the size of the screen or the hard copy page overflow to the next line and are left justified. When a response exceeds the number of available lines, then the query can be scrolled or terminated. Queries can, of course, be saved for subsequent re-examination. Search criteria can readily be modified prior to re-execution.

In additon to On-Line Query, a special subset of the On-Line Query produces reports in a batch environment. This facility is designed to provide the end user with an easy to learn capability while offering features which enable sophisticated reports to be generated. Batch Query is keyword driven from a simple pre-formatted input form. As with On-Line Query, output is columnar with automatic alignment of headings and data items. With On-Line and Batch Query at their fingertips, end users have rapid access to the information they need to make decisions.

To meet the more specialized skills of the data processing professional, TIS also has a Comprehensive Retrieval facility.

Typically, Comprehensive Retrieval is used where data base navigation is complex or where data is accessed from data sets outside the TIS environment.

Yet TIS's ease of use introduces new security demands. To assure that the end user is permitted access to only permissible information, TIS uses Logical View and password protection. Users can access only the Logical Views for which they are authorized. Passwords offer additional security by restricting an individual's access not only to Logical Views but also to the system in its entirety.

All TIS Retrievals utilize the Logical View concept. Repetitively used queries and retrievals can be stored in the Directory as Finite Logical Views (FLV), independent of the data base structure.

The design of the TIS environment satisfies the need to provide consistent information to the decision makers at all levels and within all departments of an organization. The data comprising the information must be kept current. It must, therefore, be available for modification, additon and delection.

TIS Update Management offers two facilities to access the data base for maintenance.

Generalized Data Base Maintenance: On-line addition, deletion and maintenance of data items is made available to the end user through the TIS Generalized Data Base Maintenance facility. It utilizes the same easy-to-use, natural language developed for the TIS On-Line Query. Repetitive update requests can be saved in the Directory for subsequent re-execution. These requests are independent of the data structures.

Interactive Procedures: The sometimes complex logical relationships between data items demand that updates by strictly controlled. This control can only be established through procedural code developed by an individual cognizant of the complexties. A flexible on-line screen definition in conjunction with a powerful procedural language that interfaces to the data base through the TIS Logical View, allows applications to be developed rapidly, efficiently and independent of the data base and data communications environment.

When using the update facilities, data integrity must be preserved. The TIS Task Level Recovery (TLR) facility monitors the activity to ensure that the data base is logically and physically protected.

TIS, as a truly interactive, on-line information system requires two levels of communication, external and internal.

External: With TIS the slection of the appropriate vehicle to handle external communications can be made independently. Both ENVIRON/1 and CICS are fully supported.

In the TIS environment, requests to the software facilities can be generated in a variety of ways. For example, a request can be from a 3270-type terminal, from a card reader or from a remote computer. Transfer of the request to the TIS software requires Communications Management. To ensure independence in TIS Communications Management, a protocol has been developed. Interface routines accept requests from whatever device is being used and manipulate the data into the required format. The interface routines can be associated with the data communications monitor (ENVIRON/1, CICS, et cetera), with a batch interface program or, in a distributed environment, a remote computer, or programmable device. The TIS protocol requires a specific format known as a Logical Control Block (LCB). The LCB is the highest level of request within TIS. It is independent of the communications medium and also independent of the data base environment. Additionally, a user's request can be stored as a series of LCBs, a Finite Logical View, in the TIS Directory for subsequent re-execution by name.

Internal: The Logical Control Blcok, as stated earlier, is also independent of the data base. The TIS software contains re-entrant modules that determine what the Data Base Management System is and where the data is physically located. This is achieved by reference to the Directory. Once the location is resolved data extraction commences as specified by the user requested selection criteria and output formats. To avoid constant reference to the Directory, repeatedly used requests (queries), may be saved in the form of Physical Translation Blocks (PTB). Provided that no physical change has been made to the data items (a modified Logical View), the PTBs are accessed directly circumventing the need to translate the LCBs. If a change is made to the data items, even a change as extreme as a different data base technique (relational, set theoretic, et cetera), the existing LCBs can be reprocessed, with no impact on the end user, by use of translation and extraction modules.

The LCBs are used for both external and internal communication. They represent a standard protocol that allows the TIS software to remain independent of both the data communications and data base environment.

The TIS software is designed to manage the changing needs of business and data processing industries. The software is divided into five components:

Directory: An integrated TIS Data Base containing all data necessary to control and manage the information system. Includes data item definition, data item location, Logical Views, users, security codes, saved logical requests, and descriptions of the physical environment.

Data Base Management: TIS Data Base represents a single controlled source of all organizational data. The design concepts of TIS allow this data to be accessed independent of physical structures and data location. This independence permits the ISC to optimize the performance characteristics of the data base as dictated by changing need or improve technological capability.

Retrievals Management: The TIS Logical View concept allows all users of retrievals to interact with the data independent of structures. Retrievals are also designed to offer language capabilities suited to the particular aptitude of the users. Principles of artificial intelligence are used to accomplish this objective. The languages are deemed user-friendly and the security requirements are stringent.

Update Management: Information is often of dubious value if the data from which it is derived is not current. Interactive Procedures and Generalized Data Base Maintenance facilities allow both data processors and non-data processors alike to modify, add and delete data items within their Logical Views. This updating is independent of data base structure and data location.

Communications Management: Standard protocols are used to allow internal and external communication to take place independent of the data communication and data base environments. Both ENVIRON/1 and CICS are supported by TIS.

These five components represent the TIS environment. The Directory is central and the remaining four components are fully integrated with it.

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Operationally, the TIS software is responsible for all jobs and/or tasks that interface to it. The software must manage and control the TIS activities in all partitions or regions. To achieve this objective a "central mode" of operation is required. This "central mode" enables the software to be viewed as an extension of the operating system.

TIS is designed to manage and control the data resource. Task Level Recovery ensures complete data base integrity.

The TIS concept of environmental independence provides an organization with the necessary software tools to confidently address the changing needs of business and data processing.

From the successful foundation of data base, TIS allows data processing to begin the transition to the information systems decade. And, as data processing builds information systems that truly reflect the needs of an organization and its top management, data processing's value to the organization will grow. In fact, the advantages TIS brings to the decision maker are more than matched by the new opportunities it offers data processing.

- TIS reduces data processing work loads, freeing professional staff to build new application systems. Thanks to TIS's direct user interaction, translation of user requests is reduced, freeing the data processing staff to continue refining the effectiveness of the information system.

- TIS enables data processing to anticipate and absorb change more readily. The design criteria anticipate the need for change. Data processing can react quickly to evolving business needs.

- TIS allows data processing to respond to technological innovation. Conversion can become a way of life as data processing attempts to respond to continued changing technology. With TIS, no conversion is required in assimilating change.

- TIS offers data processing centralized control. The TIS Directory represents a control center for the information system. Access to the data base is strictly controlled through security codes and passwords. For users, whatever their level in the corporate structure, TIS offers unprecedented capabilities.

- TIS gives the user rapid and direct access to information. TIS On-Line and Batch Query facilities mean that the user no longer experiences translation delays. Answers are displayed rapidly in the required format on video monitors or reports.

- TIS offers user-friendly languages for information access and update. Utilizing the principles of artificial intelligence, TIS allows the user to query and update data through a familiar, natural language.

- TIS offers complete independence from the data base and data communications environment. The unique Logical View concept of TIS allows all levels of users (data processing and on-data processing alike) to access data independent of data structure and location.

- TIS allows an organization's information need to determine data base design. Through TIS Info-Design, the information needs of an organization can be analyzed and modelled to generate a responsive information system.

- TIS represents an invaluable management tool. TIS offers the most significant improvement in the administration of an organization since the introduction of the computer itself. For the first time the information necessary to decision-making is directly available to all levels of management. Vital business decisions can be made without delay.

TIS is the beginning of the next level of end user driven software. It has been created to eliminate CHANGE as the chief enemy of the DP executive. Systems of the eighties will produce more information than our current imaginations allow. By 1990 programming, as we know it today, will have ceased to exist. Changes in future hardware and software will bury us if we are not prepared.

The audio user system of tomorrow is blossoming in the mind of a university student today. Laser technology, a research project of a high school freshman and the completely artificially intelligent human sounding Star Treck Computer, with a personality all its own, a dream of my seventh grade son.

Only in our industry will his dream come true.

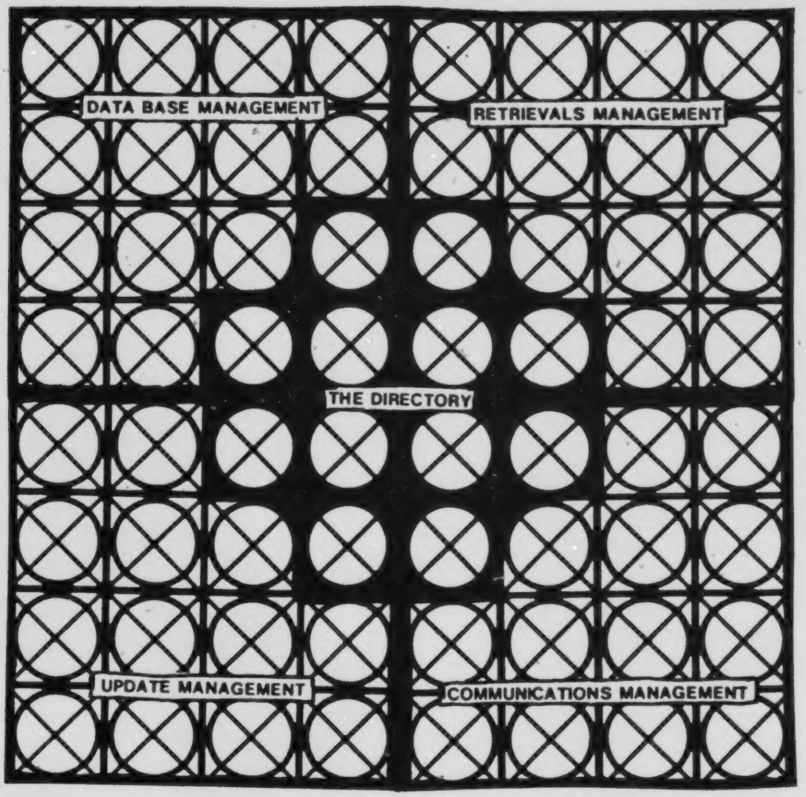
ATTACHMENT A

U.S. Computer/Programmer Census						
	Computers					
Year	General Purpose	Dedicated	Total	Programmers	P/GP*	P/T**
1955	1,000	0	1,000	10,000	10	10
1960	5,000	500	5,500	30,000	6	5.5
1965	20,000	2,500	22,500	80,000	4	3.6
1970	45,000	25,000	70,000	165,000	3.7	2.4
1975	75,000	150,000	225,000	220,000	2.9	.98
1980	125,000	575,000	700,000	275,000	2.2	.39
1985	175,000	925,000	1,100,000	330,000	1.9	.30

* Number of programmers divided by number of general-purpose computers

** Number of programmers divided by total number of computers

ATTACHMENT B


DATA BASE MANAGEMENT
RETRIEVALS MANAGEMENT
THE DIRECTORY
UPDATE MANAGEMENT
COMMUNICATIONS MANAGEMENT

UNIVERSITY OF NOTRE DAME

INTEGRATED GIFT SYSTEM

W. E. Bartholomew
and
Thomas R. Pilot Jr.

The Integrated Gift System (IGS) is used at Notre Dame by the Public Relations and Development Office. The system has the capability of handling all transactions relating to fund raising and the Alumni Office. This system was a very effective tool in achieving success in their recent capital funds campaign. The primary emphasis of this paper is in identifying the key aspects of the system and how it is being used.

The following is the outline for this paper.

I. Background
II. The New System (IGS)
III. Future Considerations
IV. Summary

I. BACKGROUND

A brief background of the Development Office is necessary to understand the operation prior to the new system.

First, and most importantly it was a totally manual system. There were about 75,000 old Master Cards which were the hub of all activity relating to the gift and pledge processing. (See Exhibit A). It is a typewritten document with the demographic data recorded on the front and giving information on the back. Data for all reports was an accumulation of manual documents from the daily processing.

The second major manual activity was the Addressograph plate operation. A staff of four full time people (plus some student help) maintained two complete sets of plates. One in zip code sequence used to imprint envelopes for mass direct mail solicitation. The other set was in class year sequence used to generate mailings for individual classes. There were three machines to print out names and addresses and two pieces of equipment to stamp out new plates. The equipment and plates have been scrapped and the staff has been assigned to new duties.

In the fall of 1975, Notre Dame was finalizing plans for a $130,000,000 capital funds campaign. The funds were crucial to the implementation of Fr. Hesburgh's vision of Notre Dame. The major effort of the campaign would be completed from 1976 through 1980. The entire constituency would be solicited in various phases with the emphasis initially on selected large donors. At this time the question was raised about the use of a computer system to handle the increased volume of gifts that would be generated by this effort. It became evident that a computer system was crucial to the execution of the campaign.

Following several lengthy discussions in December 1975, it was decided that an interim system should be implemented. It was interim in the sense that it would not use an IMS data base management system and would be limited to pledge reminder processing and campaign progress reports only. Finally the most difficult part of the decision was the required due date of October 1976, for the first reports.

Each new project at Notre Dame has a project team assigned. The team is led by the user representative. Other members of the team come from the Computing Center Administrative Applications group and its Data Base group. The Notre Dame Information Systems Office also was represented. The team faced some questions that needed almost immediate answers because of the due date for the first reports. Complete in house development and contract programming were removed from consideration early in the process. The question of purchasing a vendor software package or implementing an operational system from another university called for further evaluation.

The first step in the software evaluation was to review vendor packages. They were all expensive and would require extensive changes to fit our requirements. Our review included a visit to Northwestern University where they were operating a system purchased from the Arthur Andersen Company. Next we evaluated what was available through the CAUSE Library from other universities. That search led us to two systems. One at Yale University and the other one at the University of Utah. Both systems were reviewed in depth and we travelled to the University of Utah for a one day review.

A decision was made to lease the University of Utah system because it came the closest to fulfilling our needs. Even so it required modifications to precisely fit our needs. It was also concluded that terminal input was preferred to card input. This decision was made in February 1976, just seven months before the first report was needed.

A recap of the important dates of the project are listed below:

Project approved - December 1975

Software decision - February 1976

Conversion started - July 1976

First Progress Reports - October 1976

Conversion Completed - May 1977

Phase I Completed - October 1977

Final Phase Completed - July 1979

II. THE NEW SYSTEM

The New System (Integrated Gift System) will address these three questions. A) What is it? B) What does it do? and C) How is it used? The discussion will be the system in operation today with no comments concerning the various phases of the project.

A. WHAT IS IT?

1. It is a comprehensive system. All processing requirements of the Development Office and Alumni Office are satisfied with the system.

2. It is an interactive terminal system. A computer program interacts with the operator in all terminal activities. The operator is coached in procedural matters and input errors are identified for immediate corrective action.

3. It is a batch update system. Transactional input is handled on-line, however, the master records are not affected until a batch update is made. New inquiry files are created following each update to the master records.

4. It is a series of files and reports. The primary file is the IGS Master File made up of approximately 95,000 demographic records maintained in upper and lower case, about 205,000 gift records, and over 20,000 pledges records. Business information relating to the donor is maintained in Business Master File. There is a file used to cross reference the donor's zip code to an Alumni Club number. The NDIS Table File is used to validate codes and provide English descriptions of codes on reports.

   Daily reports include: a) an Audit Trail showing all activity on this update run; b) a Gift Register; c) an Accounting Journal for the Accounting Office; d) a report showing the donors that will have an acknowledgement letter printed on the IBM 6640 printer; e) a series of control pages used to insure the files stay in balance; f) selected Master Record printout. The Master Record Printout is requested via the terminal. This printout shows all information currently available on a donor including individual gift and pledge records since the inception of the new system and summary records for transactions prior to the new system. This printout is used to process transactions when the entire contents, in detail form, must be known. It is used exclusively in handling required adjustments to the gift and pledge records.

B. WHAT DOES IT DO?

1. It does on-line inquiry. After the terminal has been LOGGED ON with the central computer a command is entered to invoke the terminal programs. A screen then appears that has only two tags and two input fields at the top. They are ACTION: and NAME OR ID#: (See Exhibit B). This screen serves as a starting point for all screen activity and if input is being done it is also the ending function following each successful transaction. Inquiry and printout action codes can be used while viewing the previous display. For example you could have a basic inquiry on the screen for Paul Jones and enter an inquiry for Ralph Smith. There are two action codes for inquiry, two for input, two for printout and two for balancing.

   All terminal activity requires an ACTION code and either a name or ID number to be entered. If the ID number is known it should be used because the response time will be faster. If a name is entered, the cross reference file is searched looking for an exact match. If an exact match is found on the initial search the program proceeds to do what the action code called for. If no exact match can be made the way it was entered, the program then alters (shortens) the search key and tries again. The program alters the key four times, with the final search being just the last name, before responding that the name is not on file. All names on the file that matches an altered search key are displayed on the screen. Also the identification number, street, and class year are displayed. The terminal operator uses the information being displayed to select the ID number of the correct donor. The ID number is then typed in the name or id#: field and processing continues. Exhibit C shows this kind of display.

   The second part of the on-line inquiry concerns the displaying of donor master record information. (See Exhibit D). The upper part of the screen contains the demographic data. The left side of the lower part contains pertinent information about prior and current campaign pledges. The account restriction, original balance, current balance, amount of each installment, start date or status and the reminder code are the fields shown for each pledge. The last line on this side is the latest gift date and amount. On the right side of the lower half are the following fields; largest yearly gift over $500 prior to the new system, total giving prior to the new system, yearly totals since the new system, and the grand giving total.

   As noted earlier there are two action codes for requesting printout. The one for immediate hard copy is explained here. This printout is requested when the detail contents are not necessary and the need is right now. It is a very useful tool for regional directors and the department head. (See Exhibit E). As can be seen it is a pre-printed form. The format is the same as the basic inquiry screen. The only difference is the presence of the business address information.

2. The next part of the discussion under 'What does it do?' concerns the processing of transactions. There are two action codes that permit entry of new transaction data while viewing the condition

of the existing file. One action code displays just the address data and allows those fields to be corrected. (See Exhibit F). The other action code displays the same data as on the basic inquiry screen and permits corrections to the demographic data, permits entry of pledge payments with a single keystroke, and accepts any combination of three pledges or gifts on the bottom three lines of the screen. (See Exhibit G). All input data must pass exhaustive validation and editing checks before it is accepted. All errors are identified back to the terminal operator by highlighting the data in the field.

Control transactions are entered to insure that a group of transactions were correctly entered. There is a limit of forty gifts or pledges that can be entered before a balancing process is done. When a group of individual gifts has been entered, the terminal operator runs an adding machine tape of the "checks" and/or cash and counts the number of gifts. The appropriate action code is entered and the count and dollars are entered in the Name or ID# field. The computer program then adds up the detail gifts previously entered. If the number entered equals the control amount entered and the counts are equal, the entered transactions are moved to a permanent transaction data set. If the controls are not equal the entered transactions are displayed back to the terminal for checking. Incorrect entries are deleted from the temporary file and subsequently entered correctly. This process is repeated until the group is in balance with the external control.

When a group has been accepted, the dollar amount and number are recorded on a manual control sheet. At the daily cut off time the manual control sheet is totalled. Another computer program is then initiated that accumulates all the input transactions from all terminals and all input screens and displays the statistical data on the screen. The manual totals are verified and the bank deposit checked. This procedure assures that the input transactions agree with the manual controls before an update run is made.

3. How the system handles acknowledgements is the third and final section of 'What does it do?'. In each update run a 'letter' file is created for subsequent transmission to the IBM 6640 printer located in the Development Office. For each gift processed a record is created that has the donor name and address, the gift amount, the restriction, the number of gifts this year and the salutation which is determined by program logic.

The computer file is transmitted to the IBM 6640 and is received there by recording on magnetic cards. The magnetic cards are referred to as variables. The variables and a constant letter body are then read back into the 6640 with it being in the local mode. The printed output is a personal letter and envelope for each donor in the variable magnetic card file. The letters are correspondence quality, and appears to be individually typed when in reality they are 'mass produced'. Remember the donor data is maintained in the file in upper and lower case and the salutation is, through program logic, individually customized.

C. HOW IS IT USED?

This part of the paper is directed towards the use of the reports produced by the system. Certainly the terminal operation explained previously, is using the system and the daily reports, the donor record prints, and acknowledgment letters are important uses but are not repeated in this section.

1. The first consideration will be a discussion of how the system assists in identifying prospects. The entire spectrum of master file codes can be analyzed individually or in combination with each other to categorize donors into various groups. Another important aspect is the inclusion of the prior and current giving patterns as well as previous campaign pledges in determining internally projected potential for the current effort.

   Identified prospects are listed on a report showing name, address, donor type, degree codes, potential code, special relationship, giving information, home telephone, and business address and telephone. These reports for the most part are produced for primary cities.

   The next step in the identification process is for the regional director to take the city listing discussed above into a primary city for a screening session with key volunteers. These sessions are held to further identify and qualify donors into potential groupings. Additional demographic information is also sought such as business data, position code, preferred name or nickname and spouse name. When screening sessions are completed, the research group of the Development Office searches for additional data that might assist in assigning the expected potential code. Finally all pertinent data is entered into the computer system to be available for subsequent processing.

2. The next major element will be an analysis of how the system proved helpful in the actual solicitation process. The solicitation activities relate to a particular primary city and follow the same organizational structure as the screening sessions. The system was used to identify the donors who are to be invited to attend a primary city function. The function was the campaign kick-off in an area. Several University executives would attend and explain the campaign and how this assembled body was a vital link to its success.

   Following the function, the very best prospects would be called upon by the University professional fund raiser in person. The next level of prospect was handled by a volunteer working closely with the university staff personnel. The solicitor would be provided with a prospect card (See Exhibit H) for each donor they were to contact. If the contact was in person, the campaign pledge was documented with a signed pledge card. (See Exhibit I) If the pledge was secured through a telephone call, it was recorded on the lower right portion of the prospect card. In all cases the pledge information was entered into the computer system. Pledge reminders can then be produced on the schedule indicated. (See Exhibit J)

Those donors not being contacted personally or by phone are handled through the direct mail method. Individuals are requested to return a pledge card indicating their commitment. The pledge card is identical to the one used for a personal call except it is a different color. This permits entering the source of the pledge with different codes so reports can be produced which reflect the progress from the various efforts.

The mass solicitation of donors on a fairly uniform interval are handled by direct mail using the Cheshire label process. Occasionally the mass effort is done through computer output directly on continuous envelopes, printing in upper and lower case. This method of output approaches typewriter quality and makes a very attractive mailing piece. Finally, very selected groups are solicitated with personal letters produced on the IBM 6640 Printer. This is the ultimate in quality and has the highest 'personal touch'.

3. The next function is to review actual progress and to identify where additional emphasis is needed. The unit being reviewed is the primary city where the screening sessions were held, the functions were held, and where the solicitation was performed. Each primary city had a dollar goal established. The reports by city identify who made the larger commitments and more importantly who has not made any commitment. This is an action report and was a very effective tool for the regional directors and the volunteers.

At a higher level and broader base is a regional progress report which accumulates progress for an entire region. Also there are two other reports that show progress for the entire campaign in comparison to the goals that were established. One compares the number of commitments received in an amount range structure versus the goal. For example, the goal might be for 75 donors to make a commitment of one million plus dollars that would produce an aggregrate amount of ninety million dollars. The report will internally make the comparison and calculate the percent achieved in each of the amount brackets. The final report discussed in this paragraph deals with progress within each of the major components of the campaign and compares it to the goal and calculates a percent achieved. This is a two page report showing the detail and summary for each of the three components which are: a) Endowment, b) Physical Facilities, c) Current Use.

On an annual basis the system will, upon request, produce an entire set of annual reports. The annual report set consists of ten sub-reports, each dealing with a specific set of statistics. Also in the accounting area, large unrestricted gifts and gifts in kind are listed annually. The annual report to the Council for Financial Aid to Education is produced from the system.

There is a wide variety of miscellaneous annual and on-request reports that can be produced. In this area are such things as: a) Notre Dame Magazine Labels, b) Reunion Listings, and c) Class Year Listing. Two reports are placed on microfiche and mailed to the Regional Offices in New York, Chicago, and Los Angeles.

III. FUTURE

A. The first part of this discussion relates to conditions as we see them on an overall general basis. Continued high inflation will be a fact of life that must be planned for on a rational basis. The "baby boom" is over which indicates that the applicant pool will be declining. There will be extreme competition to maintain and attract a qualified staff because of inflation and other factors. As inflation continues its upward sprial the competition for the charitable dollar will become more evident. The university will face an almost daily challenge to maintain excellence in all its endeavors. The question of tenure will certainly warrant careful continued evaluation. There currently is a delicate balance between the technical and liberal arts education which could have an impact on the university operation. The 'proposition 13' mentally will affect the tax supported institutions. And like them or not Federal Government controls will continue to plague our every move.

B. Next, let us discuss the future in general from the Development Office perspective. There must be increased productivity from both the clerical staff and the professional fund raiser. There will definitely be an increase in the constituancy because of slight increases in number of graduates each year and the life expectency is longer. All aspects of solicitation must be on a more selective basis. The 'personal touch' must be continued and enhanced if possible. Although Notre Dame currently enjoys the highest percent participation by its alumni, it can be improved. And finally additional campaigns will be a necessity if Notre Dame is to continue to be a leader in its field.

C. Some specific computing needs for the Development Office is the next topic for discussion. As the final phase of the system reaches maturity, additional terminals will be needed. These could be of the portable variety and/or permanent installation in the regional offices. Terminals at screening sessions would add a new demention to that process. Improved response time at the terminal is highly desirable. There will need to be periodic systems upgrades as conditions change. Without specific definination, the 'paperless office' concept coupled with a comprehensive word processing system is a very desirable goal for the future.

D. The computing center must support the needs of administrative users. Specifically for the Development Office the Center is planning on the following activities. The new IBM 3279 color terminals will be installed in May 1980. An automated interface from the student system will be provided to add the parents of incoming first year students to the IGS file. An interface will be constructed to the accounting system for the daily gifts. The question of converting the existing file structure to an IMS Data Base management system will be evaluated in the near future. The Development Office and other users will be trained to input their own special requests through the use of MARK IV. The requirements of a real-time network for our administrative users will be reviewed on an on-going basis over the next few years.

On a more general outlook we see a greater need to share systems with one another. The system being presented here became a reality on a very demanding time schedule primarily because the sharing concept was used. Economic conditions dictate that this is the direction of the future.

In the past ten years there has been remarkable improvement in the cost performance ratio. As seen from this vantage point, the next 10 years will be even better in respect to cost performance.

IV. SUMMARY

The events leading up to the systems decision and the conditions in the Development Office were discussed. The significant condition was the fact that the Development Office had a total manual system.

The new system was then presented. These three questions were answered. WHAT IS IT? WHAT DOES IT DO? and HOW IS IT USED?

Remember these points:

- It is a comprehensive system.
- It handles on-line inquiry.
- It processes transactions.
- It automatically produces personal acknowledgements.
- It is used to identify and solicit prospects.
- It produces very usable reports.

The future was discussed very briefly. The important conclusion can be that although todays system solves todays problem very adequately, it is not utopia. The system must be capable of growing and changing to keep in step with changing times and advancements in technology.

More information on the technical components of the system are available from the Computing Center or the CAUSE Library.

Old Master Card

CONTRIBUTIONS

Year	Amount	Remarks
		$25,000 Pl.11-19-6 JWF
12-31A-68	5,000.	Val. B.T. N.Y. Debentures
		DD Brod. JWF on $25,000. Pl.
11-28-69	5000	on $25000 pl. JWF
9-28-70	5,000.	on $25,000.Pl. JWF
		[illegible]
		$25,000 pl. JWF
10-29-71	5000,	on $25,000.PL. (1968 Pledge) per Peg.

1065.

Year	Amount	Remarks
7-25-72	5000.	Fr.Brennan Mem. Sus.Fund #4121-008-0000 JVG
10-3-72	5,000.	$25,000 pl pd. in full
9-24-73	5,000.	on $25,000. Pledge
5-16A-74	500.	DD:EPJ Relief of Univ. Expense #9999-91116-764002 EPJ
10-3-74	5000.	on $25,000.Int BCR
11-12-74	3750.	on $25,000.Int. JWF
9-15-75	100.	Relief of Univ. Expense #9999-91116-764002 JVG

TER CARD AB '29 NEWKIRK

[redacted] 12/78

AB'29

303 So. Second St.
Rochelle, Ill. 61068 (X)
4-27-70

006915-3

306 Lincoln Highway,
Rochelle, Illinois.

Box 146
Rochelle, Ill. 4-18-57

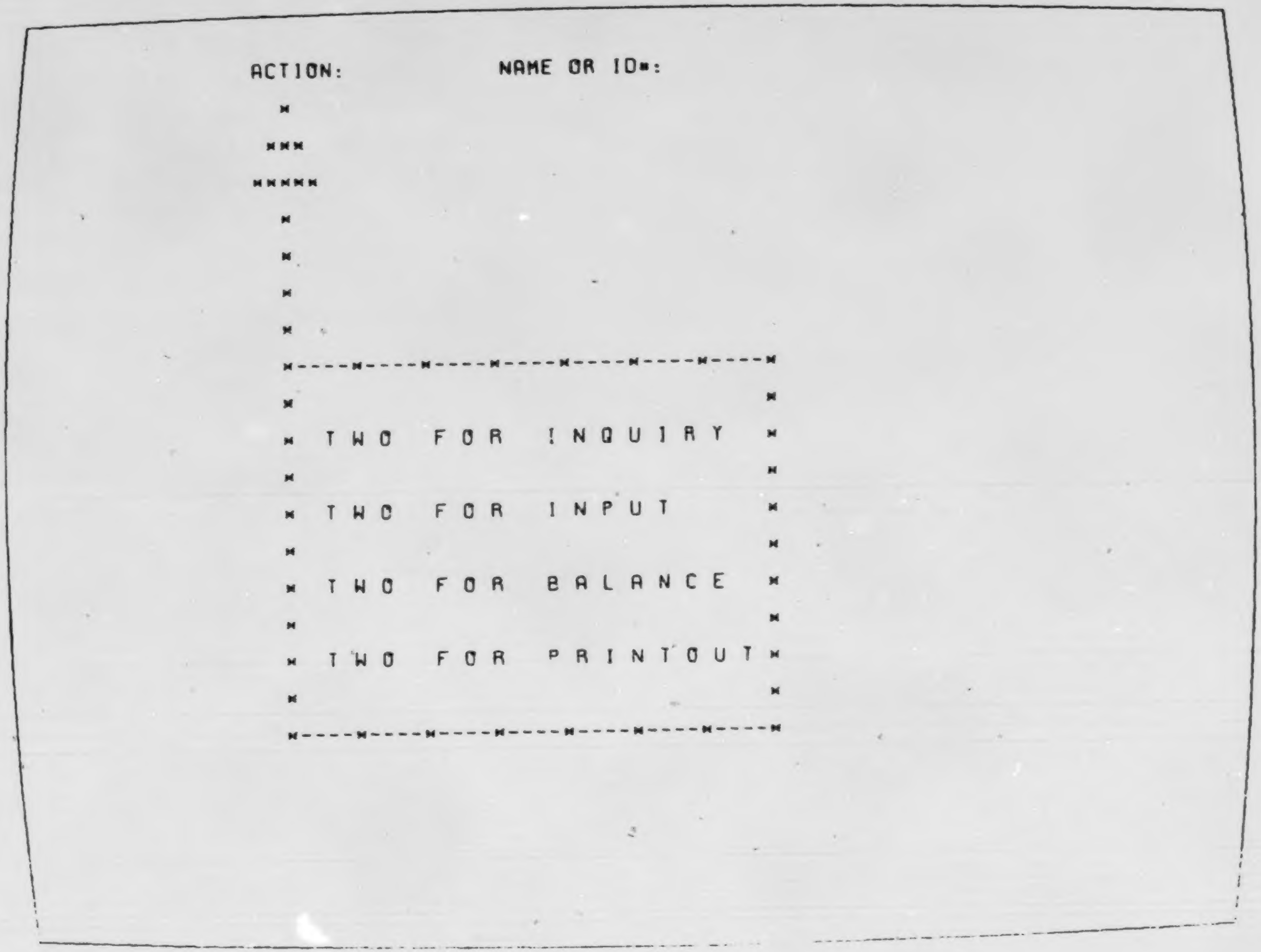
303 So. 2nd
Rochelle, Ill. 4-1-63

Box 146
Rochelle, Ill. 61068 4-10-67

CONVERTED
SEP 15 1976

EXHIBIT A

12



```
ACTION:           NAME OR ID#:
   *
  ***
 *****
   *
   *
   *
   *
   *----*----*----*----*----*----*----*
   *                                   *
   *  T W O   F O R   I N Q U I R Y    *
   *                                   *
   *  T W O   F O R   I N P U T        *
   *                                   *
   *  T W O   F O R   B A L A N C E    *
   *                                   *
   *  T W O   F O R   P R I N T O U T  *
   *                                   *
   *----*----*----*----*----*----*----*
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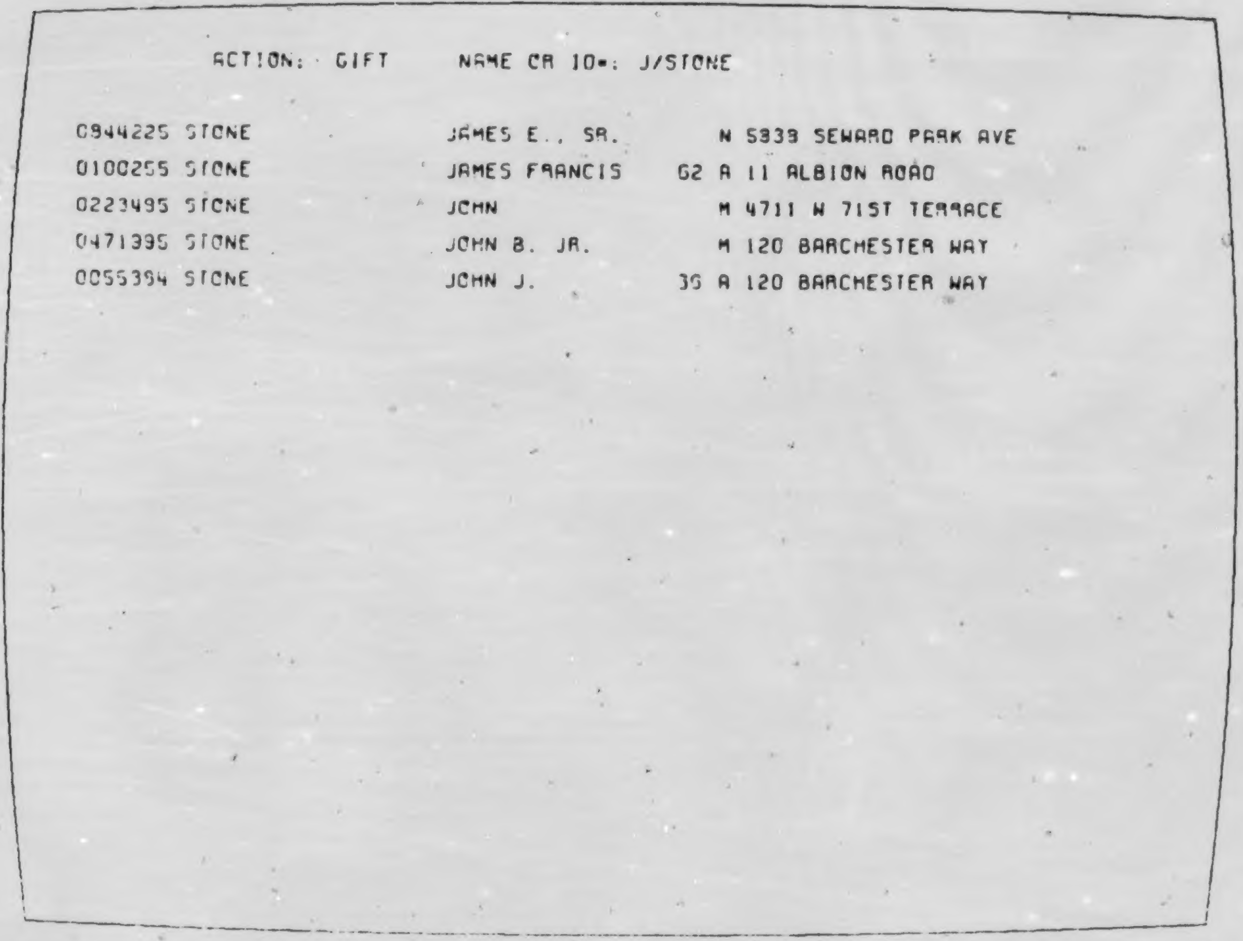
Action Code Screen

EXHIBIT B

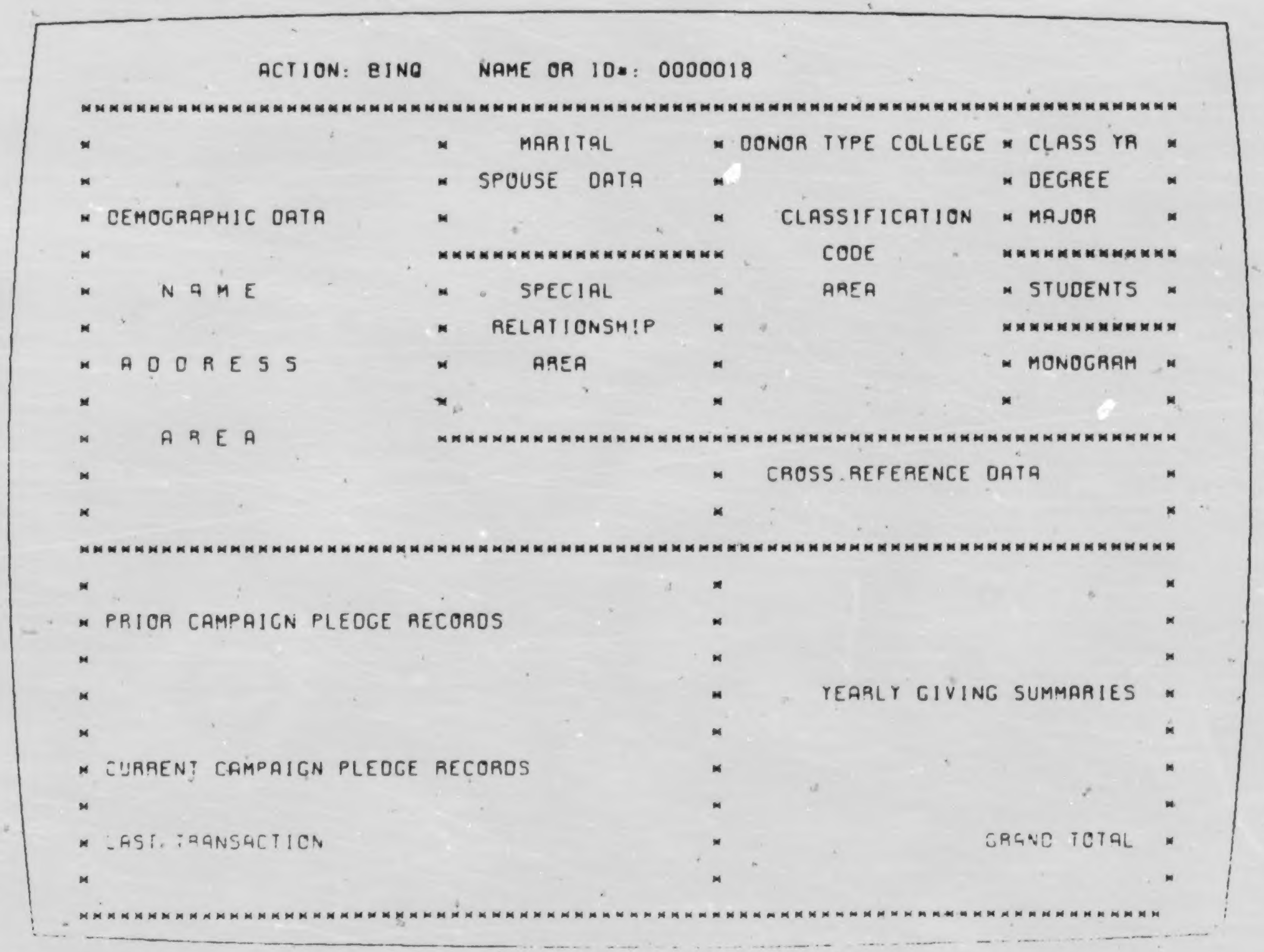


```
          ACTION:  GIFT     NAME OR ID#: J/STONE

0944225 STONE               JAMES E., SR.        M 5939 SEWARD PARK AVE
0100255 STONE               JAMES FRANCIS     62 A 11 ALBION ROAD
0223495 STONE               JOHN                 M 4711 W 71ST TERRACE
0471395 STONE               JOHN B. JR.          M 120 BARCHESTER WAY
0055394 STONE               JOHN J.           35 A 120 BARCHESTER WAY
```

Cross Reference Display Screen

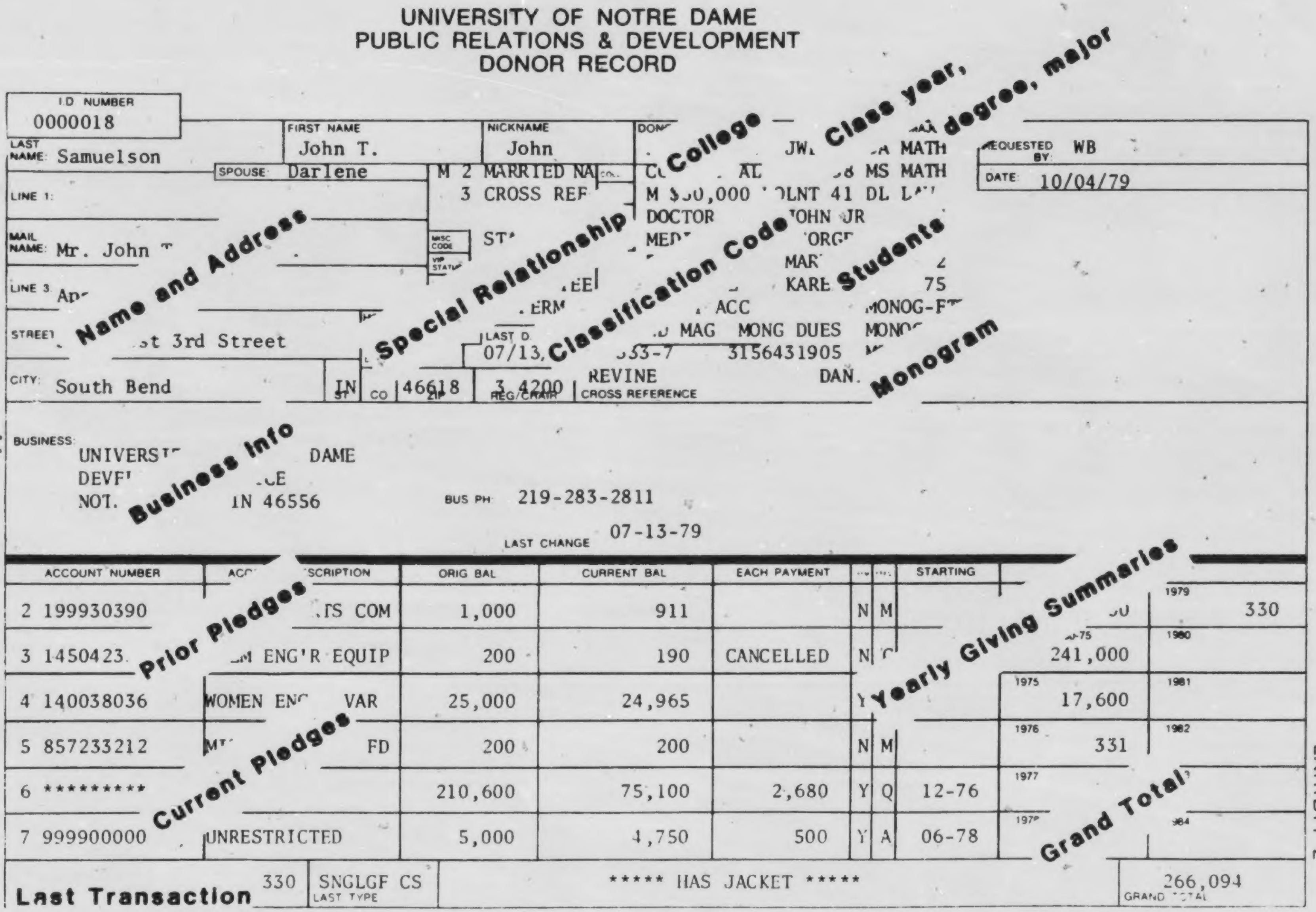
EXHIBIT C



```
          ACTION: BINQ    NAME OR ID*: 0000018
***********************************************************************
*                     *     MARITAL        * DONOR TYPE COLLEGE * CLASS YR  *
*                     *   SPOUSE  DATA     *                    * DEGREE    *
* DEMOGRAPHIC DATA    *                    *   CLASSIFICATION   * MAJOR     *
*                     **********************        CODE        *************
*     N A M E         *     SPECIAL        *        AREA        * STUDENTS  *
*                     *   RELATIONSHIP     *                    *************
*  A D D R E S S      *       AREA         *                    * MONOGRAM  *
*                     *                    *                    *           *
*     A R E A         *****************************************************
*                                          *   CROSS REFERENCE DATA        *
*                                          *                               *
***********************************************************************
*                                          *                               *
* PRIOR CAMPAIGN PLEDGE RECORDS            *                               *
*                                          *                               *
*                                          *     YEARLY GIVING SUMMARIES   *
*                                          *                               *
* CURRENT CAMPAIGN PLEDGE RECORDS          *                               *
*                                          *                               *
* LAST TRANSACTION                         *                   GRAND TOTAL *
*                                          *                               *
***********************************************************************
```

Basic Inquiry Screen

EXHIBIT D


Name and Address
Special Relationship
College
Class year,
degree, major
Classification Code
Students
Monogram
Business Info
Prior Pledges
Current Pledges
Yearly Giving Summaries
Grand Total
Last Transaction

Donor Record Print

UNIVERSITY OF NOTRE DAME
PUBLIC RELATIONS & DEVELOPMENT
DONOR RECORD

I.D. NUMBER 0000018
LAST NAME: Samuelson
FIRST NAME John T.
NICKNAME John
SPOUSE: Darlene
LINE 1:
MAIL NAME: Mr. John T
LINE 3: Ap
STREET ...st 3rd Street
CITY: South Bend
ST IN
CO
ZIP 46618
REG/CHAIR 3 4200
CROSS REFERENCE REVINE

M 2 MARRIED NA
3 CROSS REF
ST
...EE
...ERM
MISC CODE
VIP STATUS
LAST D 07/13,

DON...
CO... AL
M $50,000
DOCTOR
MED...
ACC
...D MAG MONG DUES
...553-7 3156431905
JW... ...68 MS MATH ...A MATH
...OLNT 41 DL LAW
JOHN JR
...ORGE
MAR... 2
KARE... 75
MONOG-F...
MONO...
DAN.

REQUESTED BY: WB
DATE: 10/04/79

BUSINESS:
UNIVERSI... DAME
DEVE... ...CE
NOT... IN 46556
BUS PH 219-283-2811
LAST CHANGE 07-13-79

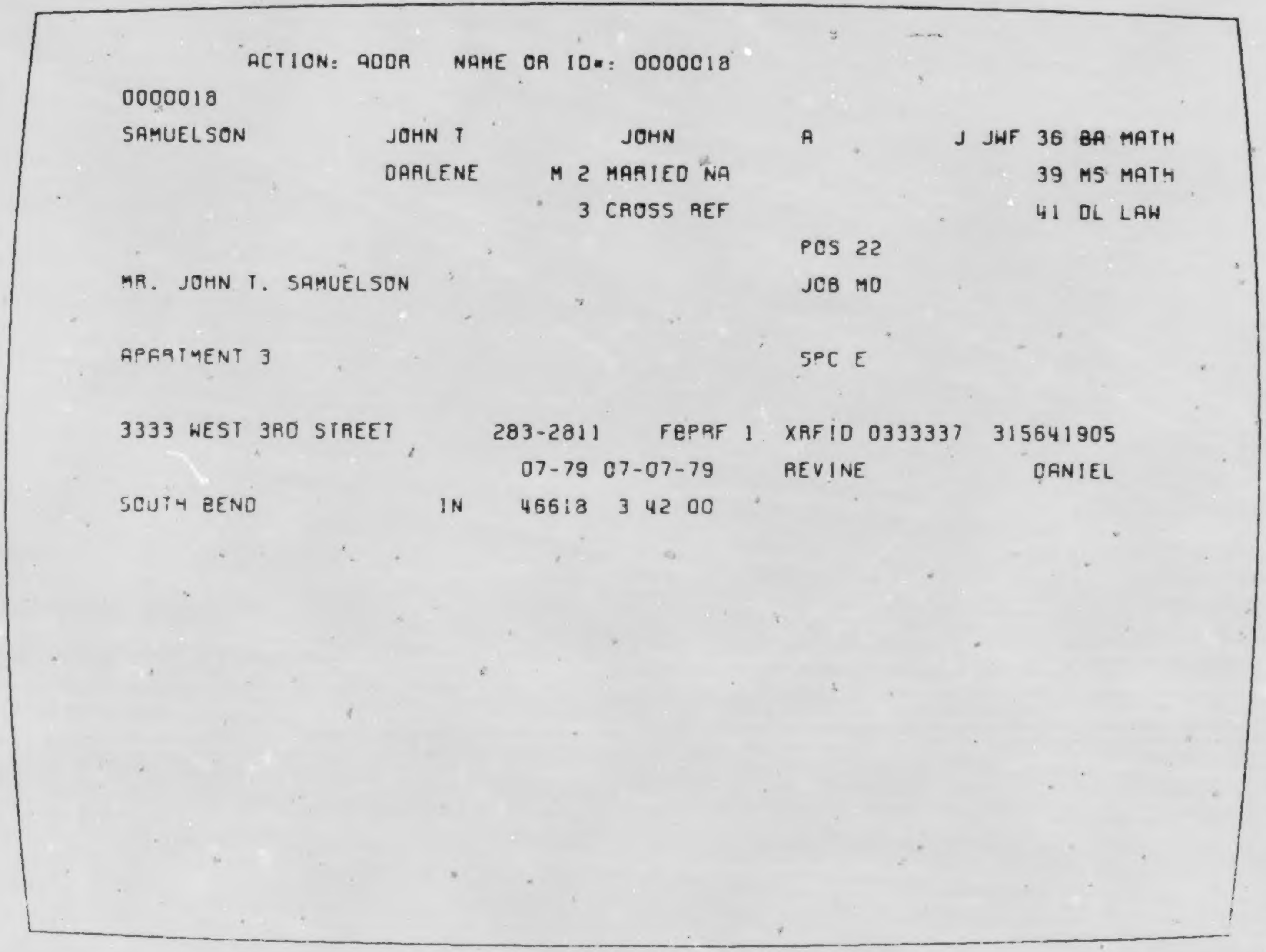
ACCOUNT NUMBER	ACC... ...SCRIPTION	ORIG BAL	CURRENT BAL	EACH PAYMENT			STARTING		
2 199930390	...TS COM	1,000	911		N	M		...00	1979 330
3 1450423.	...M ENG'R EQUIP	200	190	CANCELLED	N	C		...-75 241,000	1980
4 140038036	WOMEN ENG VAR	25,000	24,965		Y			1975 17,600	1981
5 857233212	M... FD	200	200		N	M		1976 331	1982
6 *********		210,600	75,100	2,680	Y	Q	12-76	1977	
7 999900000	UNRESTRICTED	5,000	4,750	500	Y	A	06-78	1978	1984

330 SNGLGF CS
LAST TYPE
***** HAS JACKET *****
266,094
GRAND TOTAL

EXHIBIT E

16

440



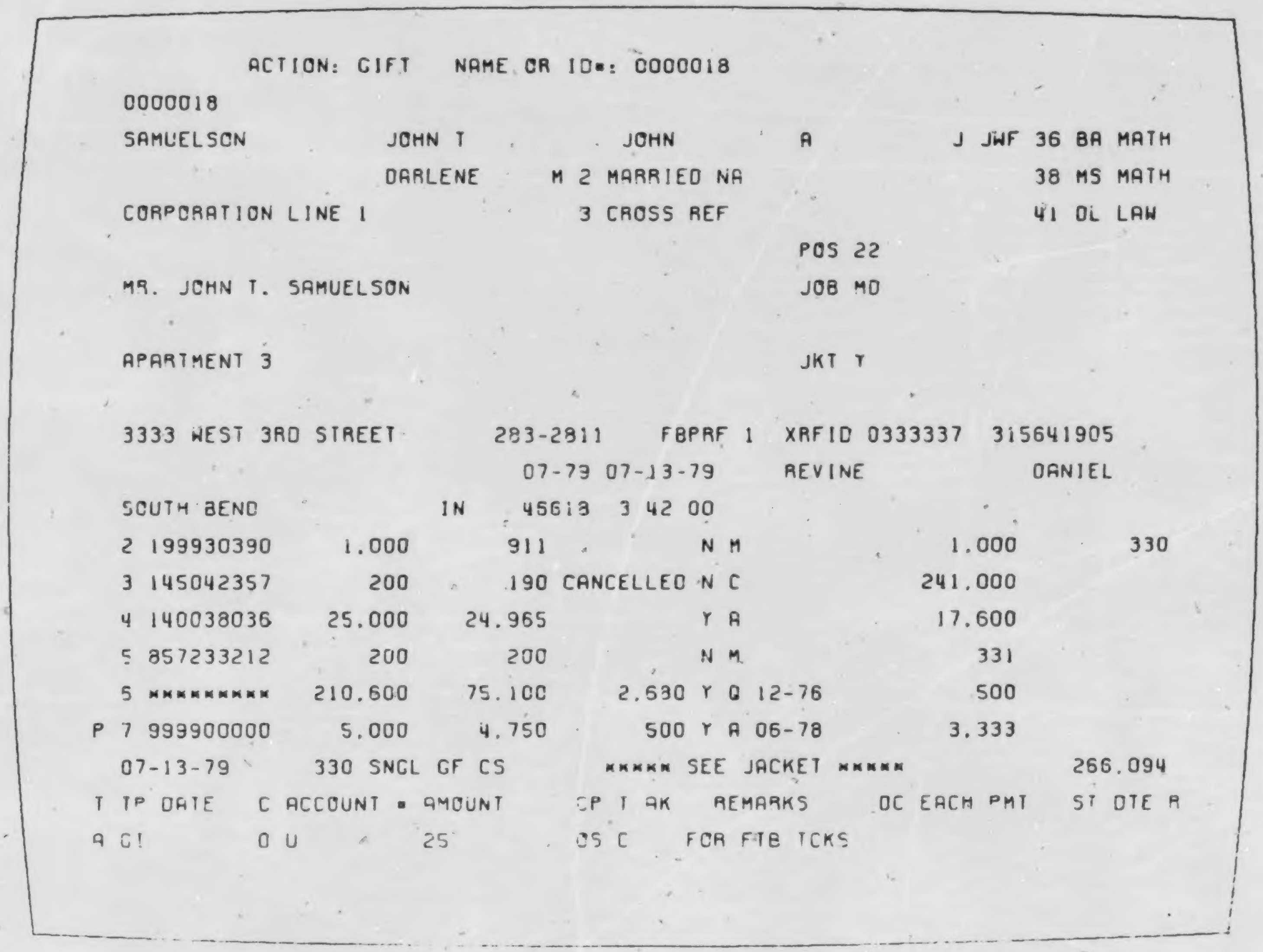
```
        ACTION: ADDR   NAME OR ID#: 0000018
0000018
SAMUELSON          JOHN T            JOHN          A           J JWF 36 BA MATH
                   DARLENE     M 2 MARIED NA                          39 MS MATH
                                 3 CROSS REF                          41 DL LAW
                                                   POS 22
MR. JOHN T. SAMUELSON                              JOB MD

APARTMENT 3                                        SPC E

3333 WEST 3RD STREET       283-2811    FBPRF 1  XRFID 0333337  315641905
                             07-79 07-07-79        REVINE               DANIEL
SOUTH BEND               IN    46618  3 42 00
```

Address Change Screen

EXHIBIT F



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        ACTION: GIFT   NAME OR ID#: 0000018
 0000018
 SAMUELSON          JOHN T             JOHN         A          J JWF 36 BA MATH
                    DARLENE      M 2 MARRIED NA                      38 MS MATH
 CORPORATION LINE 1                3 CROSS REF                       41 OL LAW
                                                   POS 22
 MR. JOHN T. SAMUELSON                             JOB MD

 APARTMENT 3                                       JKT Y

 3333 WEST 3RD STREET        283-2811    FBPRF 1  XRFID 0333337  315641905
                               07-79 07-13-79      REVINE            DANIEL
 SOUTH BEND             IN     45613  3 42 00
 2 199930390      1.000        911             N M                1.000       330
 3 145042357        200        190 CANCELLED N C                241.000
 4 140038036     25.000     24.965             Y A                 17.600
 5 857233212        200        200             N M                    331
 5 *********    210.600     75.100      2.630 Y Q 12-76              500
P 7 999900000     5.000      4.750        500 Y A 06-78             3.333
 07-13-79        330 SNGL GF CS        ***** SEE JACKET *****            266.094
T TP DATE    C ACCOUNT # AMOUNT       CP T AK    REMARKS     OC EACH PMT    ST DTE R
A G!         0 U         25           CS C    FOR FTB TCKS
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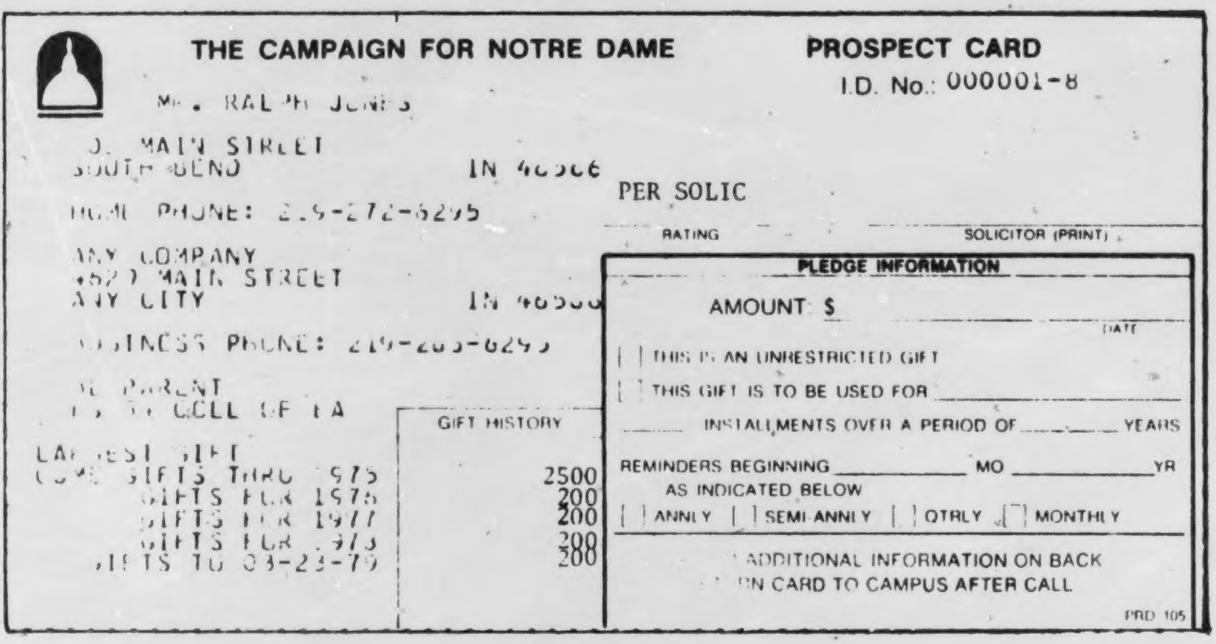
Gift/Address Input Screen

EXHIBIT G

Prospect Card

EXHIBIT H



THE CAMPAIGN FOR NOTRE DAME **PROSPECT CARD**

I.D. No.: 000001-8

MR. RALPH JONES

0. MAIN STREET
SOUTH BEND IN 46566

HOME PHONE: 219-272-6295

ANY COMPANY
4527 MAIN STREET
ANY CITY IN 46566

BUSINESS PHONE: 219-283-6295

ND PARENT
SM COLL OF IA

	GIFT HISTORY
LARGEST GIFT	2500
CUME GIFTS THRU 1975	200
GIFTS FOR 1976	200
GIFTS FOR 1977	200
GIFTS FOR 1978	200
GIFTS TO 03-23-79	

PER SOLIC
RATING
SOLICITOR (PRINT)

PLEDGE INFORMATION

AMOUNT: $
DATE

☐ THIS IS AN UNRESTRICTED GIFT
☐ THIS GIFT IS TO BE USED FOR
INSTALLMENTS OVER A PERIOD OF YEARS
REMINDERS BEGINNING MO YR
AS INDICATED BELOW
☐ ANNLY ☐ SEMI-ANNLY ☐ QTRLY ☐ MONTHLY

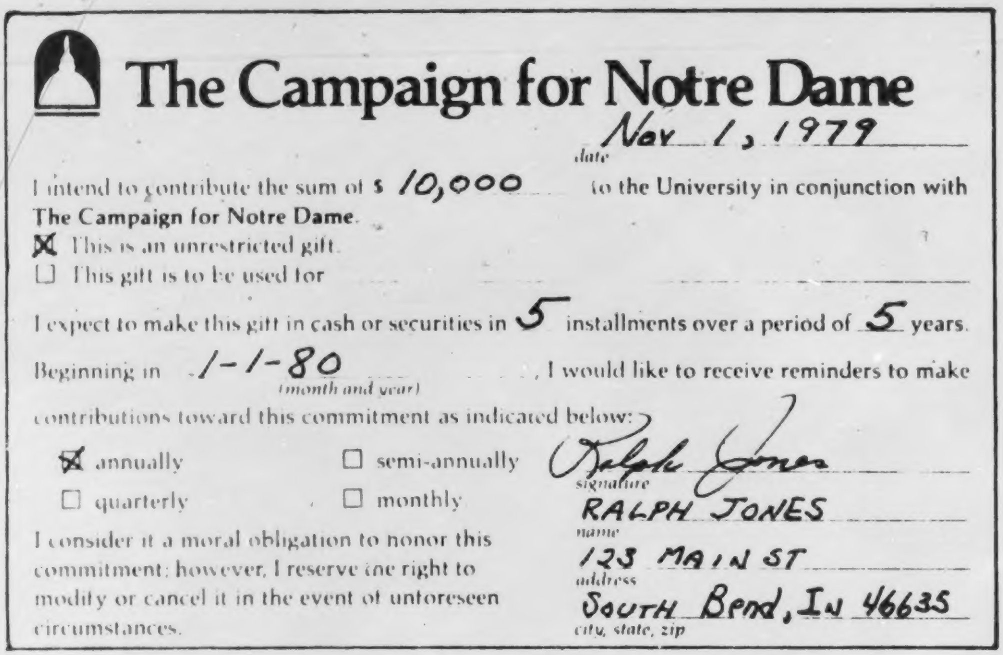
ADDITIONAL INFORMATION ON BACK
RETURN CARD TO CAMPUS AFTER CALL

PRD 105

Pledge Card

(used for personal contact)

EXHIBIT I



The Campaign for Notre Dame

Nov 1, 1979
date

I intend to contribute the sum of $ 10,000 to the University in conjunction with The Campaign for Notre Dame.

☒ This is an unrestricted gift.
☐ This gift is to be used for

I expect to make this gift in cash or securities in 5 installments over a period of 5 years.

Beginning in 1-1-80 (month and year), I would like to receive reminders to make contributions toward this commitment as indicated below:

☒ annually ☐ semi-annually
☐ quarterly ☐ monthly

Ralph Jones
signature

RALPH JONES
name

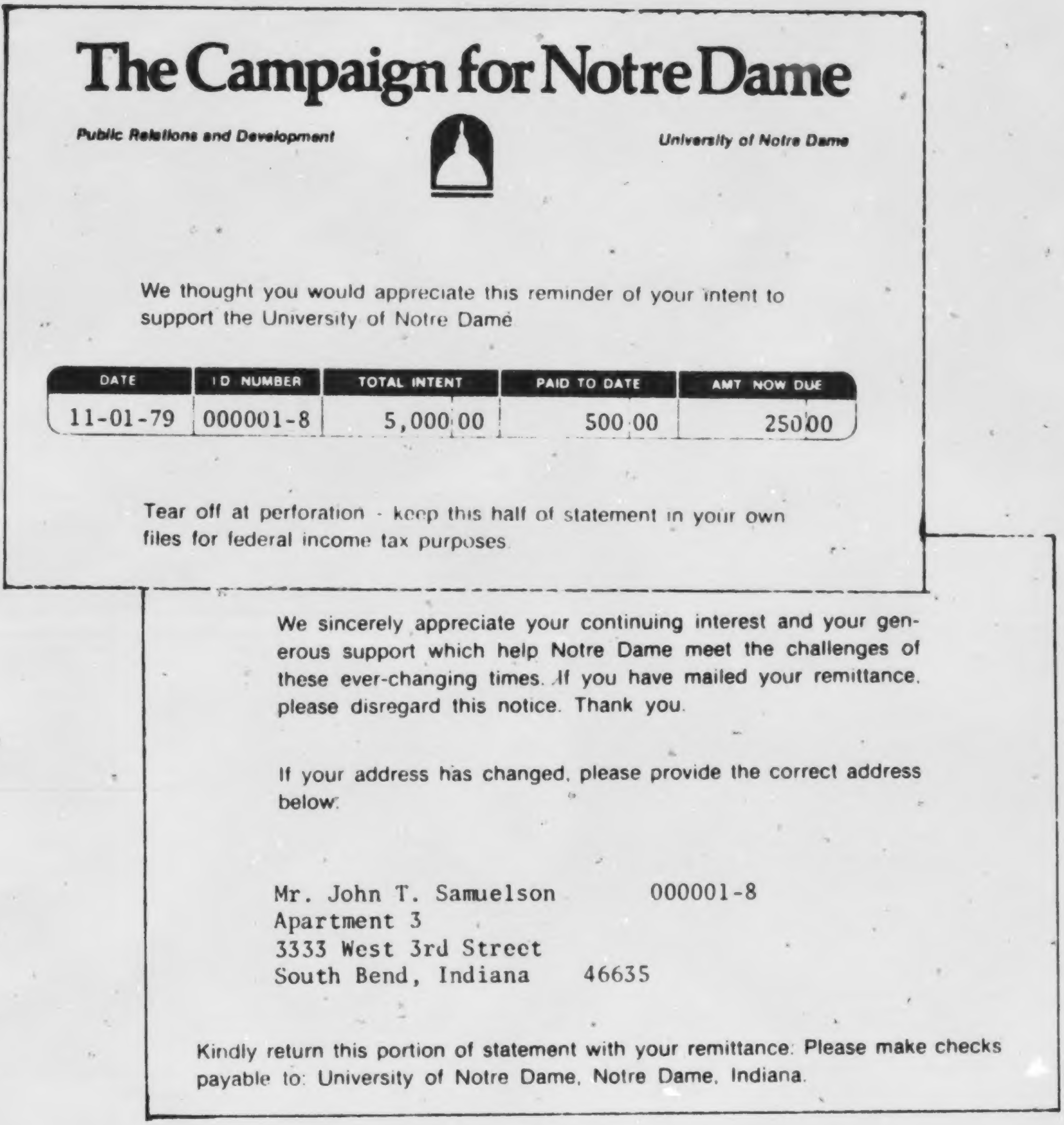
123 MAIN ST
address

SOUTH Bend, IN 46635
city, state, zip

I consider it a moral obligation to honor this commitment; however, I reserve the right to modify or cancel it in the event of unforeseen circumstances.

Pledge Reminder Form

EXHIBIT J



The Campaign for Notre Dame

Public Relations and Development

University of Notre Dame

We thought you would appreciate this reminder of your intent to support the University of Notre Dame.

DATE	I D NUMBER	TOTAL INTENT	PAID TO DATE	AMT NOW DUE
11-01-79	000001-8	5,000 00	500 00	250 00

Tear off at perforation - keep this half of statement in your own files for federal income tax purposes.

We sincerely appreciate your continuing interest and your generous support which help Notre Dame meet the challenges of these ever-changing times. If you have mailed your remittance, please disregard this notice. Thank you.

If your address has changed, please provide the correct address below:

Mr. John T. Samuelson 000001-8
Apartment 3
3333 West 3rd Street
South Bend, Indiana 46635

Kindly return this portion of statement with your remittance. Please make checks payable to: University of Notre Dame, Notre Dame, Indiana.

THE SYSTEMS ENVIRONMENT OF THE FUTURE AT LARGE INSTITUTIONS

Robert R. Simpson
Barbara H. Zimmerman
The University of Michigan
Ann Arbor, Michigan

Our paper attempts to integrate predictions about the future course of computing with expectations about the status of higher education. The result will be a presentation which describes the data processing environment of the mid-1980's at research universities. Fiscal imperatives and stable enrollments have changed a major goal of administrative systems from cost avoidance to reductions in support staff. Cutting budgets via data processing will entail elimination of paper for data dissemination and its replacement with electronic impulses. Collegiate units and central offices will utilize numerous small computers linked into a network hosted by a large machine. Such distributed processing will generally be online, and batch reports will vastly diminish in number. Less reliance on computer programs developed by central facilities will evolve through user interaction with online packages and other tools. The administrative computer facility will change significantly. Complex data bases and networks will demand a very talented staff, and systems analysis and programming efforts will mature and become more productive. The staff may grow due to increased service demands even though relatively fewer programs would be coded. The paper walks through a future student system. Attendant challenges to executive management, users, and computer professionals are addressed.

In the past, difficulty and trauma have frequently encumbered administrative computing, not only at institutions large and small, but in all types of organizations. Predictions have suggested that the coming maturity of computing will alleviate the deficiencies associated with installing systems, but the people and planning problems of the past will continue to plague those organizations expecting the new technology to be a panacea. For, computer systems will grow more ubiquitous and complex where administrative and clerical tasks are performed.

There will be incentives to integrate all aspects of computing which support management and operational functions, not only data processing or "management information systems," but also word processing, electronic mail and message processing, and "personal computing." Hardware with lower price tags and increasing software options coupled with movement of computing into smaller and smaller organizations on campus will challenge not only the computer specialists, but computing, user, and executive managements.

Until recently, computer systems at universities generally tended toward cost avoidance, not cost savings. The recent era of growth in higher education provided little impetus for reducing costs; rather, a key system objective was the capacity to process more students, more staff members, more research projects. The computer aided in this effort, but typically costs continued to rise, though not as fast as without computer support.

The fiscal pressures of the last few years will continue throughout the coming decade due to stable or declining enrollments and/or relative reductions of government expenditures. These dynamics will focus systems development on cost cutting, and a major strategy for saving encompasses replacement of written or typed information with computer transactions. Typically in higher education today, the school, college, or department is closest to the student or faculty member, and it is there that entries describing students and staff originate. The flow of the paper is sometimes convoluted before relevant documents are transformed into computerized data. Today, it is infrequent that the originators interact directly with computer systems.

This makes little sense today, for effectiveness and efficiency in data entry increases as it moves closer to the source. Not only is redundant repetition of data transcription eliminated, but quality improves. It is wasteful to type a form in a school office and then re-key the same data in one or more central offices for entry into one or more computer files.

As electronic impulses replace paper flow, computer support to the multitude of organizations which make up a university will increase dramatically. Teaching departments, school and college offices will more often interact with the computer as input becomes more decentralized. Concomitantly, more and more tools will be available to provide reports, inquiries, and analysis to the non-central offices which so frequently today receive minimal computer support. Much of the education of these departmental and collegiate users can be a natural by-product of the initiation of entry of purchase requisitions, personnel actions, admissions, financial aid awards and the like. As these interactions with the computer are understood by this new user group, its demand for outputs will multiply. Fortunately, the tools to provide this information should be available without large investments of staff in computer programs by the central information processing facility.

The migration of input functions out of central offices into academic and other units will transform the information processing role of central service units such as Admissions, Financial Aid, the Registrar, Personnel, and Accounting. While many central data entry functions will disappear, a quality control function will become more critical as diverse users enter data into various systems. But, it will be the central offices which respond to all types of managers who demand more and more types of information from the computer system to facilitate the increasingly stringent management task of the 1980's. Some central data entry needs will continue, but these quality control and information management functions will occupy these service units.

Quality information will become more important to senior managers as they face the difficult task of deciding about program closures and how to more carefully husband resources. Computerized support of decision making requires a truly integrated data base in which linkages exist where appropriate among course, facility, finance, staff, and student data. Such integration has not yet been possible in complex and large organizations such as the research university.

The road to such a complete system will be evolutionary, though the system development cycle should decrease in length and become more amenable to efficacious planning and budgeting. Several products from hardware/software vendors will facilitate this evolution, and some of them are available today, while others are on the horizon.

The small computer will play a larger role in the system of the future. Online data acquisitions systems can be developed and run more efficiently on minicomputers than large mainframes.[1] However, standard software tools do not exist to distribute the administrative data and processing at a large institution though such software will soon be demonstrated.

Today, many user-oriented packages are available. Inquiry, report production, and statistical analysis packages provide more timely generation of management information from computer data and concomitant reductions in resource requirements for the system analysis and programming function. These packages will evolve further so that they can be easily used by staff members in departmental, collegiate, central, and system offices. (Such direct interaction will sensitize users to some of the problems data processors face.) Worsening shortages of computer specialists in the years to come[2] provide another incentive to transfer tasks from programming units to user offices.

Bringing the end user closer to the computer bothers many individuals in central institutional computer facilities. The spread of minis merits some concern, for the management of a computer center is a complex job for which school and service unit managements are not likely to have the requisite skills. And, in some ways, the distribution of data and processing generates a multitude of computer centers. It will be a challenge to data processors, users, and administrators to install a framework where central standards exist to facilitate use of the computer by individuals who are not professional data processors.

Data base administration will become much more important, though it cannot totally be the province of the data processing facility. The first step in data administration is a change of mind set such that data resources no longer solely belong to individual offices, but rather to the institution. This will require more central standards and discipline.

We now want to focus on the meaning and impacts of distributed processing, for this innovation will present not only the greatest opportunities, but the most risks. The user is ready for massive changes to the way computing is accomplished. Why? Because many are dissatisfied with the traditional large administrative computer center.

The complaints include "The computer center is not responsive to local needs of the user" and "There is too long a lead time in getting a request for programming honored." Other frequently heard alarms follow. A unit's computer scheduling needs must be subjugated to the overall university computing schedule. No one on the central programming staff works for the user, so the user must obtain support from the central programming management to get his job accomplished. Data are entered by people who do not reside within the initiating office. The user has little control over his data or their handling, and he feels he has lost control of his most important resource - his data.[3]

Juxtaposed to the above problems is the plummeting cost of computers. Computing power no longer increases as the square of the costs. Rather, each year, computers, especially small ones, are getting less expensive. These two factors, dissatisfaction with central facility and the declining costs of minicomputers, have led some universities to purchase multiple small machines without due consideration to macroscopic requirements. So, an integration must occur, since data frequently need to be put together from a multi-office, institutional perspective, and not handled in a fragmented way. Computers arranged in a well designed distributed data processing (DDP) network can supply a more satisfactory solution.

What is distributed data processing? A thorough literature survey yielded perhaps as many definitions of DDP as there are authors writing about it. Authors tend to gear their definitions and scope to their audiences.

The best definition might combine elements from two different sources: the University of Waterloo and IBM. Peeples and Manning (Waterloo) state, "DDP means multiple computers logically and physically interconnected which cooperate under decentralized system-wide control to execute application programs."[4] DDP is defined by IBM to be:

- Placement of
  - Computing power
  - Information
  - Control
- To satisfy
  - An organization's requirements
  - User functional requirements
- Linking multiple processors
  - Logically (required)
  - Physically (optional)
- With a minimum requirement
  - Customer programmable
  - Information storage capability"[5]

Organizations will couple a DDP network with a Distributed Data Base (DDB). DDB permits the data base system to act conceptually as a centralized system, while physically mirroring the inherent distribution of data within an organization.[6] A distributed data processing network would provide each office with its own data. This concept is similar to the old filing cabinet, accessible when needed and instantly changeable. Data entry is accomplished by members of the user's staff, people for whom the data have meaning and importance. Those who most benefit from the correctness of the data will be responsible for maintaining them.

Job scheduling can suit the diverse needs of various offices, for a manager might obtain information on a Sunday night. Jobs frequently can be run on the user's schedule, not the one of the computer center.

Outputs can be accomplished in two ways, via high-level query languages accessed by users and by programs. The size of each programming staff will be dependent upon the needs of the user, e.g., several small users might share one programmer. The programmers will be more responsible and responsive to the users, but they must adhere to central standards.

Distributed data processing would facilitate computer message switching so all terminals at an institution could communicate. Each office with terminals can engage in message switching. Transactions can be transmitted to electronic "mailboxes" for an individual, an office, or for processing by another system at a later time. A broadcast facility (sending a single message to many users) can also be implemented, as can be online conferences. These functions can be accomplished on a single, large machine, but economics help justify a distributed approach since "processing costs are falling faster than communications costs."[7]

Batch reports will decrease, as it will no longer make sense to print voluminous reports on paper. Many computer facilities may take an intermediate step of providing random access to existing reports via computer terminals.[8] A number of firms have ceased producing large printed reports; instead, they are stored on random access input/output media and are available to appropriate terminal users. A great reduction in the number of paper reports ensues, and delays in distribution would be eliminated, so all recipients would have access to a report at the same time. Since delivery delays can isolate remote schools and departments, terminal access would allow geographically distant schools to feel more in the university mainstream.

Since the recipient frequently needs only a small portion of a detailed report, the online reporting system could distribute the report logically among computers (or perhaps store all of it on the maxi). Each office would access its part and see only the portion of interest. No paper needs to be printed, but the ability to print any portion from the CRT would be available. Eventually, the storage of batch reports on discs will probably disappear; users will merely request the specific information they desire and appropriate detail or summary data would be almost immediately displayed on the screen.

Let us now consider a "John Smith", an entering freshman who has applied to the Distributed Data Processing University, and follow his data through his academic career.

Admissions: John Smith applies to DDP University. His data are entered locally into an admissions data base. Included in this data base are demographics, test scores, high school record, data which track credentials, etc.

Student File: Once accepted, data needed for post-admissions processing are transferred to other files. Since John has applied for Financial Aid, data related to this application are moved to a financial aid data base.

Registration: When he registers for classes, probably a central process, the course data base is accessed, and the appropriate files are updated enrolling John in his courses. Tuition charges are calculated, and an accounts receivable record is opened. Financial aid is directly applied, and a statement is presented before registration is complete.

John was a highly regarded quarterback in high school, and he has made the team. Certification data are entered into the data base.

Two weeks after classes have begun, John has decided to drop calculus. The appropriate files, including enrollment and Accounts Receivable data, are updated. At the end of the semester, grades are entered by the professor, and the academic record is updated.

Between semesters, John Smith seeks and obtains a part-time job with grounds and maintenance. A new record is opened to include payroll data and work history information.

When our student becomes a scholar, he is given a job as an Instructor within the Chemistry department. Faculty data are added, including the usual curriculum vita information, workload data, student evaluation summaries, and peer reviews.

How is this scenario different from today? Under DDP, administrators process only that portion of the data significant to them. Only those aspects of the student's career over which they have jurisdiction is in their files. The remaining data are accessible, but not stored locally. The student file, although viewed as one file, is actually a DDB. The student's school is the place where most student data reside. Each school (for example, dental, medicine, graduate, arts and science, business, engineering) has its own student file. This is significant, for the type of data a medical school would need differs from what a fine arts department would require.

Certainly some of the student's data, such as the ability to register and course elections, would be common across all distributed student data bases. This information could be located at the host or distributed depending on the access needs of each site.

Payroll information is usually centralized while faculty data are distributed. Each department head would have access to his own department's faculty data.

Because the data base is implemented on a distributed network, all data is available to any user, assuming "need to know." To the user it is transparent where the data are stored. All the data are available right at his terminal. But because the most frequently accessed data are stored locally, the average response will be faster, and communication charges will be lower. Rothnie and Goodman, in a 1977 paper, suggest locating "portions of the data base near to where they are frequently used...faster access to data may be achieved and communication costs reduced."[9]

In a survey of the literature covering DDP, the concensus was that batch functions belong on the large computing facility while interactive online functions are best handled on minicomputers.

The data base, no matter how distributed, must appear as a complete entity to each user, so that he has the illusion that all the information is stored at the end of the terminal. For example, the financial aid officer who seeks the complete dossier on an applicant must be able to access all security-cleared information with the facility and nearly the speed by which he can access the local financial aid segments. The departmental advisor with appropriate security clearance would have access to needed financial aid information with Smith's transcript and current elections of courses.

We expect to see networks with a large central computer, the host, and satellite minicomputers, the nodes. These nodes will reside in administrative and departmental offices connected to both intelligent terminals and the host. The large machine will do batch processing, some message switching, and DB coordination. Most activity on such a network will be between the intelligent terminals and minicomputers.

With the cost of hardware decreasing rapidly, the trend for proliferation of small machines will continue. This rapid expansion of small machines is due in large part to user dissatisfaction with the central computing facility. The central computing facility has two choices. Either, (1) haphazard acquisition and use of independent machines will eventually cause more problems than they solve or (2) the new technology of cheaper machinery and better software is applied to develop an orderly migration to a distributed data processing system responsive to the end users and the institution as a whole.

There are formidable challenges surrounding the construction of an integrated and distributed computer system which supports all levels of university management and operation. Executive management, data processing management and staff, and users will face different arrays of problems, though all participants in the construction of advanced information systems will face many of the same problems. Many of these difficulties have dominated the development difficulties in the past.

The key ingredient that managements, data processors, and users must bring to the system development activity is commitment. The rewards of the system development enterprise are largely a function of the length and strength of the commitment from involved parties. Too often, ill considered decisions are made in favor of solving today's crisis while reducing the effort on projects which are many months or a year away from implementation. Such a short-run outlook toward data processing is myopic, since good long-term solutions will dramatically reduce short-term problems of the future. Users, data processors, and administrators need to realize that diversion of resources from long-term activities is counter-productive. There will always be pressures for (1) users to work on today's crisis rather than tomorrow's system and (2) systems analysts and programmers to work on easy, short-term problems rather than the difficult, long-term ones. Perhaps strong interest from senior management is the most effective incentive for long-term commitment to a major system undertaking.

The system of the future will demand organizational change if cost savings are to be found. We have alluded to the movement of data entry activity from central offices to schools and colleges. Such organizational change will reduce substantially the amount of labor devoted to human processing of data. It is unlikely, however, that such transfers of responsibility will occur without political complications. Staff members involved in building computer systems throughout the institution will be far more effective if they understand the requirement for organizational change associated with moving data entry closer to the source.

The final challenge to all participants in the system building process relates to training. Today, a concensus exists that training activities are woefully inadequate. Effective programs must develop to educate executives, users, and data processors. New software tools and practices deserve attention, as do project management tactics and overall system development planning strategies.

The primary challenge for executive management will be to bring leadership and support to the system development process. Only senior institutional officials have the clout to focus the planning activities. The political difficulties of systems planning are immense for any university officer; effective planning requires "either-or" decisions, so many constituencies will receive what they perceive to be short shrift. It is usually ineffective to allocate small amounts of system development resources to a large number of activities. So, the executives must decide what gets done and when, hopefully insulating the data processing director from much of the heat. The executive group must find the money to fund systems development while making appropriate budget reallocations to fund system operation. (There should be operational savings which make much of the trouble worthwhile.) Finally, the leaders must shepard the organizational change.

Perhaps the greatest challenges will devolve to the data processing management and staff. This group will have primary responsibility for planning for and designing the integrated systems in the new environment. Since planning is our weak point today, both inside and outside the data processing center, considerable resources must be devoted to installing effective project management processes.

But, effective planning strategies and project management procedures will not assure cost-saving, integrated systems which support decision making. Modern systems analysis and programming practices must be installed in the data processing shop. We believe that it will not be possible to produce desired systems which are amenable to modification without structured systems analysis, modular programming, and the like. Successful implementation of modern systems analysis and programming practices cannot be done by fiat, and meeting the challenge will follow only with substantial investments of management time and thoughtful human relations.

One of the most typical deficiencies in data processing organizations relates to human relations. Part of the problem is structural; data processors typically have systematic approaches to thinking and problem solving, while users most often use intutitive techniques.[10] This dichotomy in user versus data processor thought processes has much to do with the major problem between systems and user people, that of trust. Better human relations between the data processing facility and the organizations that it serves increases the productivity of system development activity.

It will be difficult to find staff who are both competent at the new systems and programming concepts and practices and better equipped to relate to users. Moreover, the complexity of the computer networks which support distributed systems will demand staff support that is almost unavailable today. The bottom line is that a computer center's staff must be larger and more talented (and, no doubt, better paid) if efficacious systems are to be developed in the future.

The art of software selection will become more critical. Because more computer functions will be done with user-oriented, friendly software tools, the decisions about which packages to install become more important. The financial trade-offs of various options will be complex, for computer time (including differences between minis and maxis), computer staff center resources, and user staff resources will vary depending on which package is picked. Great skill will be required to effectively analyze various options.

As data processors become more adept at human relations, users will need to learn to trust data processing people more. We believe that the relationships between systems people and the users at large universities can be more difficult than elsewhere because of the complexity of the institution and the lack of a profit motive. Trust evolves almost automatically as time passes and users and systems analysts get to know each other, so a strong argument can be made for stability and continuity in staffing both user offices and the computing facility.

If the data processors provide packages for inquiry, statistical analysis, and detail and summary report production, users will need to become adept at using packages if they are to exploit the new systems. This will require large investments of time initially, but experience will quickly reduce the learning curve.

Users in central offices will have the most difficulty coping with organization change. Central offices will have new relationships with those units to which data entry is distributed. In addition, instead of providing outputs from its system to all interested individuals and organizations, the central office will be faced with quality control of computerized data and the need to disseminate information about and from the system to departments, schools and colleges, and executive management. The size of staffs in many central offices will decline as data entry functions become dispersed.

The technology is moving rapidly, but many of the problems with system development will remain the same in the next decade as in the past - people problems. We believe that the major challenges will be for (1) executive management of institutions to lead all participants, (2) data processing people to become more adept at human relations, and (3) users to move to a more active role from the passivity of the past.

ACKNOWLEDGEMENT

We wish to express our deep appreciation to Mrs. Gwen Gilbert for secretarial assistance on this project. Her good nature and expertise proved invaluable.

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PERSONNEL COST MANAGEMENT BY TELEPROCESSING

by

Jerry Wallace
Larry Hunter

University of Idaho
Moscow, Idaho

An administratively responsive position control system depends on a functional mix of uniquely defined input, standard operational procedures and the ability to quickly access information in a special format. The University of Idaho's Position Control System (UIPCS) is unique in the amount of flexibility provided for handling of complex appointments and in its compatibility with the University's and statewide information systems. It is integrated with the University's personnel system so that employee-related information is not reentered into position control, but rather "called" from the common personnel/position control data base.

The UIPCS has several operational objectives to accumulate and report data for information and use; such as monitoring the number of people, their accumulative full-time equivalency, continuing salary obligation and reconciliation with payroll each month with respect to authorized positions, salary amounts and specific budget designations. The system must continually be responsive to the management philosophy of the University administration and have information that is useful for various management reports. On-line capability exists for both inquiry and maintenance of budgeted positions, operating positions, personnel action transactions and budgeted support funds.

While an Idaho State Employee Information System (EIS) will provide some of the information needed by state-level offices, it is necessary for UIPCS to be compatible with EIS, maintaining current common information and providing supplemental data when necessary.

Personnel cost management is representative of the single most complex and expensive investment in higher education--human resources. The many employees that are involved in the instruction, research, service, and related support functions of higher education institutions represent more diverse roles than will normally be found elsewhere. We administrators, who are responsible for the monitoring of the investment in personnel, must be capable of informing institutional executive management of the impacts of the changing budgeted commitment to individual employees.

The need to compile relevant data about changes in current employee status and to project those into the base data for the next fiscal year obligation are, in fact, separate but equally important requirements of any position control system. Common to this set of relevant data, at most of our institutions, will be the number of employees, full-time equivalency, authorized salary amounts, sources of funds, etc., to give us the reporting capability to respond to these general operating needs. The basics of position control are essential and well established so the intent of this paper is to discuss the approach to the establishment of the data base, the concepts between related data and the flexibility of the system. Explanation or examples of these issues will allow you to see the utilization of basic data for other operating management purposes.

The usual problem of maintaining only uniquely defined data within the system is especially important to systems that deal with personnel. Definitions from full-time equivalency to classification status vary with institutional administrators, governing boards and state agencies so the need to assure that definitions are a function of interpretation of input rather than entry is critical to the usefulness of the system. All data elements need to be reduced to the level that they are given, not manually computed. For example, rather than enter FTE, enter the components of the definitions of FTE such as number of months appointed, appointment basis, percent time working and percent of budget distribution. With this data and a formula used to define FTE, it is a simple derivation for the computer rather than manual computation and entry. Especially important is that, if the definition should change, you need only change the formula in the program and not all the data in the system. It has been our experience that the error rate of entry on given data is negligible, whereas on computed data it is relatively high.

Certain basic structures in the data base for personnel related systems can and will provide a more simple hierarchy of data to be shared within the systems. A discussion of the development of the Position Control/Personnel System basis is offered here to explain the hierarchy of data.

1. Position Control Data Base

The Position Control Data Base is primarily organized into two segment types, "Budgeted Position" data and "Operating Position" data.

Budgeted Positions represent the University's permanent, on-going salary obligation associated with each state-defined budget (department). The fiscal year qualifier permits the Budget Office to establish a new file for the next fiscal year's planning, independent of the current fiscal year file. Each Budgeted Position is associated with exactly one employee, or is vacant.

Since Budgeted Positions are defined according to state definitions, they do not necessarily reflect how a department's budget is subdivided for University and/or departmental purposes. Each Budgeted Position is therefore subdivided into one to fifteen "projects" as necessary. Many employees work for more than one department. If an employee normally works for two or more departments, he or she will be associated with several Budgeted Positions. Any combination of up to fifteen Budgeted Positions and projects can be cross-referenced with each other so that a report of one position can show all of the other positions and projects normally associated with the employee.

As the Budgeted Position does not necessarily reflect the current use of salary dollars, Operating Positions are created each fiscal year. These Operating Positions describe the budgets/projects available for paying employees filling a particular position. New operating positions can be added whenever a new source of funds (usually a grant or contract) will supply additional funding for the position. By definition, Operating Positions are indicators of the current use of budgeted dollars and are not valid across fiscal year boundaries.

2. Personnel Data Base

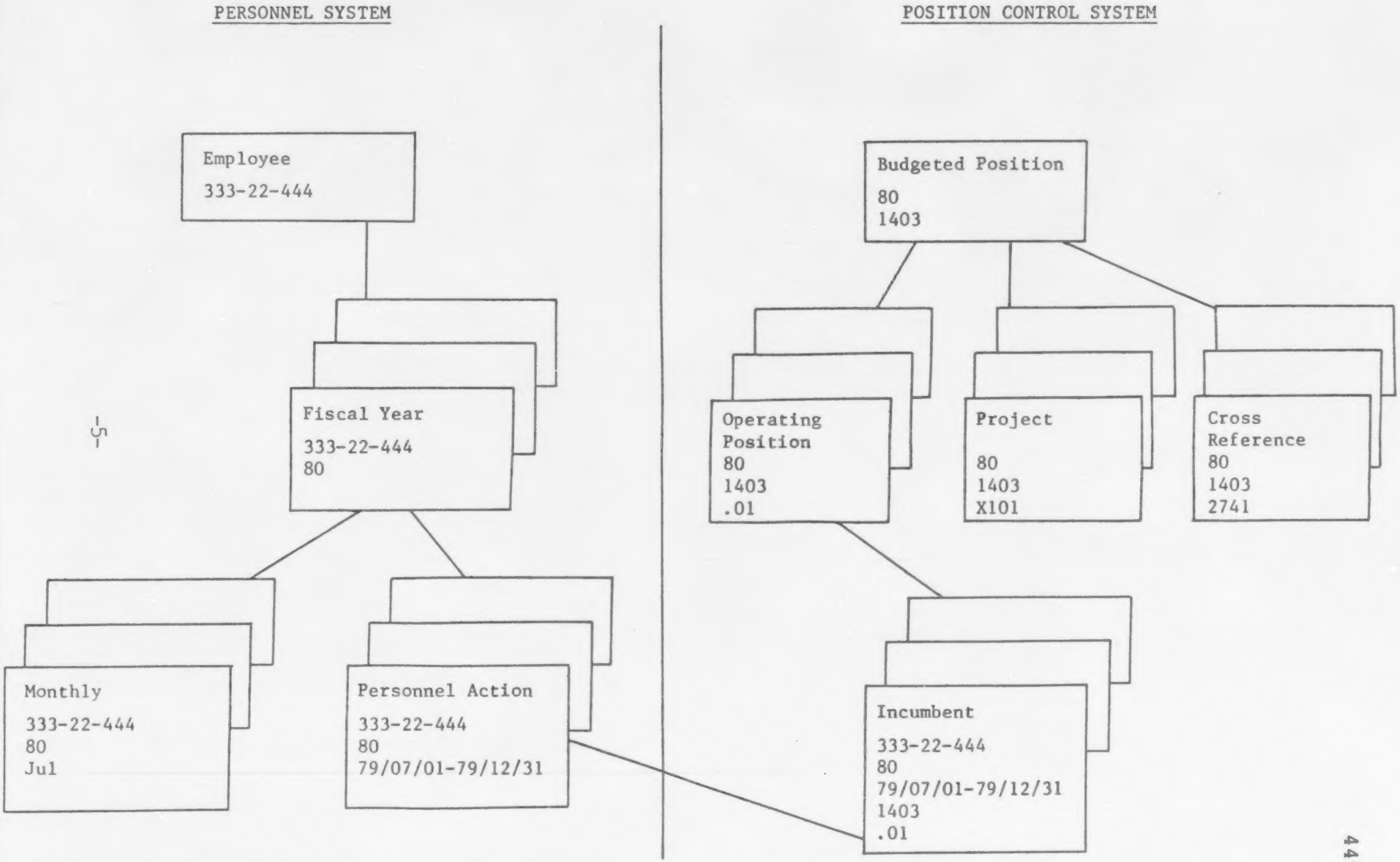
The University of Idaho Personnel System was implemented a little over a year before the Position Control System. It was designed not only to meet the needs of the Personnel Office, but to be integrated with Position Control at a later date. Many data elements maintained by the Personnel Office are shared with the Position Control System.

The data are organized into three segments: Employee (primarily demographic), fiscal year (primarily summary), and Personnel Action (representing an employee's status during a span of time). Each Personnel Action has associated with it two dates: the first date it was (will be) effective, and the last date it was (will be) effective. For an employee to be selected for most personnel reports, he or she must have a Personnel Action which is in effect for the requested date.

The concept of multiple Personnel Action segments being maintained for one employee during a fiscal year has enabled the Personnel Office to produce reports of employee information as of "next fall" or "last spring" as easy as reports of "current" information. Personnel Actions can be established which take effect on some future date without affecting reports of "current" information.

3. Hierarchical Diagram of the Personnel/Position Control Data Base

When a segment is shown below another in the following diagram, it is said to be subordinate. Subordinate segments may not exist at all for a particular segment, while another segment may have many subordinate segments. For example, a Budgeted Position may have associated with it any number of Operating Positions or none at all. The only exception will be that at least one project segment must be defined for each Budgeted Position segment.


PERSONNEL SYSTEM
POSITION CONTROL SYSTEM
Employee
333-22-444
Fiscal Year
333-22-444
80
Monthly
333-22-444
80
Jul
Personnel Action
333-22-444
80
79/07/01-79/12/31
Budgeted Position
80
1403
Operating Position
80
1403
.01
Project
80
1403
X101
Cross Reference
80
1403
2741
Incumbent
333-22-444
80
79/07/01-79/12/31
1403
.01

REPORTING CAPABILITIES

The sharing of common data and the integration of systems allow much more flexibility in the "pooling" of data to respond to questions involving different aspects of personnel related issues. The hierarchy established is essential, however, so that data in each system are protected from unauthorized changes. The resultant data base is then used by Personnel, Budget, and Management Information with assured consistency in reporting or analysis.

Given a data base as previously discussed, reporting is simply defining the relationships involved. As reports are needed by internal or external agencies, they fall into two primary categories: 1) fixed data formats or 2) special reports. The University of Idaho Position Control System was designed to address a number of fixed data format reports on a given frequency schedule. Those reports, depending upon intent, are generated monthly, quarterly, annually, or as needed. It was a major objective to design the system such that special reporting was a viable procedure within short time frames. This again is relative to the way in which data are defined and entered into the system so that varying definitions can be programmed for reporting from the data base.

To give you some understanding of the operational environment of the University of Idaho Position Control System, the following reporting capabilities are discussed. These reports are key sources of information for operating budget status and for data accumulation to use in the budget request development.

The reports are for several purposes and should be presented in groups to help explain the relativity involved. The first group consists of those reports applicable to the permanent, on-going obligation to personnel costs and to individual positions. They are used to keep track of the budget base as it concerns not only personnel costs, but also the support funds by departmental budget.

1. Budgeted Salary Report By Budget

This report is produced monthly. The report as shown below, includes all positions within the department, incumbents filling those positions, other positions the incumbent fills and totals of salary dollars and full-time equivalents for each department.

BUDGETED SALARY REPORT
BY BUDGET
FY

	PCN	Name/ Title	Employed	Appt. Basis	Status	% Time	Salary
By Individual							
Department Totals							
College Totals							
University Totals							

2. Budgeted Full-time Equivalent Report

The FTE Report is produced quarterly and serves as a monitor of permanent, authorized FTE.

3. Salary Obligation Report

This set of reports is used to provide the vice presidents with salary obligation data needed for budget planning.

The second group of reports is used to expand the base data when developing the operating budgets for a given fiscal year.

4. The Faculty and Exempt Staff Recommended Salary Report generates the working documents used by the vice presidents, deans, and heads of departments to calculate next fiscal year salary for faculty and exempt staff. The forms are then used by the Budget Office as part of the data in preparing the new fiscal year budget.

5. The Support Funds Report is a detailed list of the departmental support funds budgets as returned to the Budget Office during the budget preparation process and entered into the system through an on-line procedure.

The third group of reports is used to produce the operating budget books. With all necessary data updated for the new fiscal year, a series of reports is generated that is used to produce the operating budget documents. The reports will provide the following:

6. Summary of estimated resource and allocation of funds;
7. Detail of estimated resources;
8. Budget distribution by program by cost classification;
9. Detail of budget allocation by department of primary experience class;
10. Detail of FTE and salary allocation by department and employee type.

Additional entries into the budget book are formulated with the aid of a librarian system so that all budget books can be page-printed from a computer tape.

The fourth group of reports is used for the personnel cost management information during the current fiscal year. Once the operating budget has been prepared and approved, the entire file can be machine transferred to the financial system for the new fiscal year operating budget and the new payroll master file. The position control system and financial information systems are current and prepared for continuous operation. The resulting reports in this group are then used to compute monthly budget status reports for advising the executive committee on changes in personnel cost status. The major reports used for this purpose are briefly described below:

11. Actual Full-time Equivalent Reports

This FTE Report is an indicator of the actual use of a department's personnel budget during a fiscal year.

12. Position History Report by Budget

This report, as shown below, includes all incumbencies within each department and provides totals on full-time equivalents, anticipated expenditures and original budgeted monies during a given fiscal year.

POSITION HISTORY REPORT

	PCN	SSN	Title	Empl. Status	% Time	FTE	Salary	ANTEX
Within Position								
- by incumbent								
- by appointment segment								
Incumbent Totals								
Position Totals								
Department Totals								
College Totals								
University Totals								

13. Payroll Reconciliation Report

This procedure produces two reports which compare the incumbencies of the Personnel/Position Control System to the actual payroll payments. The first report shows exceptions in amounts paid, and pay sources between the two systems. The second report summarizes amounts paid with the amount anticipated by Budget Control Category.

14. Salary Savings Report

This procedure divides each position into monthly portions (payroll periods), compares the results with the payroll payments charged to that position for the current period and notes the differences as positive or negative savings. The general format is shown below.

SALARY SAVINGS REPORT

BUDGETED VS. EXPENDED

Fiscal Year / Period / Threshold / Payroll Run Numbers

	Position Control				Payroll		
	Dept.	Position	SSN	Amount	Name	Amount	Savings
Position Totals							
Department Totals							
Budget Control Totals							

15. Special Reports (as needed--see Appendix I for an example--HEGIS salary report)

MAJOR OBJECTIVES

Although the description of the utilization of the system for budget preparation and operating is brief, several specific objectives are seen to be accomplished.

1. Maintenance/Control Mechanism

The concept of this position control system is to maintain and/or control personnel costs by position; that is, responsive to the number of people, the accumulative full-time equivalency, and the amounts of personnel dollars expended for each authorized position established within the system. For effective accountability each transaction is reconciled with Payroll on authorized position, salary amount and specific budget designations.

2. Reporting/Control for Office of the Idaho State Board of Education, Legislative Fiscal Office and Division of Budget, Policy Planning and Coordination

The University of Idaho has the responsibility to provide fiscal information to state offices as those offices deem necessary to fulfill their obligations. Many of the state office reporting requirements are static in nature, but they will occasionally find need to request specific information that is not in the format normally provided, and the ability to respond in a timely fashion is essential to the position control system.

3. Internal Reporting Requirements

Position/personnel cost maintenance and control is a management concern and must be responsive to the management philosophy of the University Administration. UIPCS is capable of producing reports in a format compatible with the administration's requirements and flexible enough to allow changes in format relative to changes in philosophy.

4. Interface with Other Systems and Needs

The UIPCS has information that is useful to other systems for various reports such as faculty workload analysis, manpower resource studies, Information Exchange Project (IEP) reports, etc. Report requirements are satisfied to the extent that they do not detract from the primary purpose and objectives of this system.

TELEPROCESSING AND SUMMARY

The UIPCS provides on-line capability for inquiry and maintenance to budgeted positions, operating positions, personnel action transactions, and budgeted support funds.

On-line capability, to this point, has been mentioned only casually, but it is the most important contribution to the timeliness of data input and accuracy of system reporting. The ability to enter data directly to the system at the moment transactions are processed is the real strength of UIPCS. Since there is no need to reconcile the time lag of data entry, the reports can be run at any time and be using current data. An added bonus is the time eliminated in writing up entry documents, verifying data, etc. The data is entered, edited and verified in one process. Please see Appendix II for an example of the screen display for budgeted position maintenance.

All University of Idaho administrative terminals are protected from unauthorized use by passwords. By protecting the terminals, sensitive data are in turn protected. All users are required to log on; that is, enter the desired application and a password. If the application and password are valid, the next screen will request the desired screen function. Entry of the desired function will return an initial screen for the desired function.

The Budget Office has three passwords to access the data base. Each password has associated with it an access level code according to the level of access permitted authorized users.

LEVEL	PERMITTED SCREEN FUNCTIONS
1	Inquiry Only
2	Level 1 plus personnel action, operating position, and support funds maintenance
3	Level 2 plus budgeted position maintenance

Data in the Position Control system is retrieved and updated using eight different on-line functions, or screens:

Menu of available functions

Budgeted Positions Inquiry and Maintenance

Operating Positions Inquiry and Maintenance

Personnel Actions Inquiry and Maintenance

Support Funds Maintenance

Two functions used by the Personnel Office are also available to the Budget Office: Employee Data Inquiry and Master File List Inquiry.

Obviously, the update and inquiry capability of this sytem have provided input control to the budget office so that we can establish the entry priorities. This is important in timing current status of the data and reports so that we know exactly how reliable the information will be.

Entry of data with the editing processes programmed into the on-line update procedure occurs with a high degree of accuracy. Accuracy of data entry is important always, but it is especially critical when under the time constraints of the budget development process. See Appendix II for an example of editing procedures associated with the Budgeted Positions Maintenance. The ability to deal with the processing requirements of changing virtually every position and incumbent record for the new fiscal year is enhanced tremendously.

Since the specific requirements of system design must respond to each set of unique institutional characteristics, perhaps the most important lesson to be learned is the necessary commitment to developing a system that meets your specific requirements. In order to develop a successful system, you must accept the responsibility in its development:

to determine the objectives and requirements of the proposed system; to document existing systems, procedures, and needs; to have continuous input in the development with approval authority at each phase; and to oversee the final implementation and testing. It is important to accept only that system which satisfies your needs. Acceptance of a system that does not agree with the required administrative philosophy and institutional procedures will only result in many frustrating hours of work required to manually complete partial reporting capabilities.

In summary, there are several major features of UIPCS that have given the system certain capabilities at the institution. These features are briefly stated here:

1. Integrated with entire personnel data base and compatible with payroll.
2. On-line inquiry and update capability.
3. Data base is built on uniquely defined data elements.
4. Span in time system allows forecasting and reconstructing budgets at specific points in time.
6. Detailed editing of input.

These features make UIPCS unique to the University of Idaho, because each one is the result of a decision made by the Budget Office in its development. The most important aspect of this system is that it was developed in concept by the users and in detail by the Computer Center. It does what we wanted and expected it to do.

APPENDIX I

Sample Report - PCMIHEG - Management Information
HEGIS 2300-3 (AAUP) Salary Study

The following material is an excerpt from the position control system users' manual. This section deals specifically with the report cited above. Other reports are comparably documented in the users' manual.

Management Information

HEGIS 2300-3 (AAUP) Salary Study

The Higher Education General Information Survey (HEGIS) is carried out in close cooperation with the American Association of University Professors Salary Study. Three reports are generated when this report is requested.

Selection Criteria

The incumbent in a Budgeted Position for the desired fiscal year is selected for this set of reports by the following tests:

A. BP-%TIME = 100% Full Time

B. BP-RANK = 01 thru 06: Faculty

C. BP-GROUP = 14 thru 21 or 24 or 25

D. FY-UIFAC = U

E. Either

   1) BP-%XREF is greater than 50% for a Budgeted Position with BP-BC=01, BP-MJ=01 and BP-MN=01 thru 10

   or

   2) VP-EO=1 and the sum of the BP-%XREF of a set of cross-referenced Budget Positions is greater than or equal to 50% where all summed positions have BP-BC=01, BP-MJ=01 and BP-MN = 01 thru 10.

F. The Personnel Action of the ongoing incumbent in effect on the report date must be tested as follows:

1) If PA-PSTAT=A,2,S, or U or PAPSTAT=L and the duration of the Personnel Action is less than 5 months, then the ongoing incumbent in the Budgeted Position is selected.

2) If PA-PSTAT=L and the duration of the Personnel Action is 5 or more months, then an exception report is written and the ongoing Incumbent is not selected. The report shows the name, social security number, position number, PA-FROM, PA-THRU and length of the leave period, of the ongoing incumbent who is on leave. With the aid of this exception report and the online Position Control System, data concerning the replacement for the ongoing incumbent may be found and used in the survey.

Rank Conversion

Report rank is derived from the rank field (BP-RANK) as shown below. For Report 4, the rank from the previous fiscal year is used in these translations.

	BP-RANK	Report Rank
01	Distinguished Professor	Professor
02	Professor	Professor
03	Associate Professor	Associate Professor
04	Assistant Professor	Assistant Professor
05	Senior Instructor	Instructor
06	Instructor	Instructor

Report 1

This report is an aid in the preparation of Part 1 -- Salaries and Tenure of Full-Time Instructional Faculty. It contains name, social security number, percent cross-reference, salary, and tenure code. The tenure code is "1" if tenure has been granted (EM-TENRD numeric) and "0" otherwise. The report is sorted by appointment basis, sex, report rank and name with headcount, total salary, and total tenured printed for changes in basis, sex, or rank.

Reports 2

Parts 1A and 1B of the survey may be completed from this report. These parts are tables showing faculty headcount in a series of salary intervals by rank and sex. The report shows name, social security number, percent cross-reference, and salary. It is sorted by appointment basis, sex, report rank, salary interval* and name with headcounts for changes in salary interval, report rank, sex, and basis.

Report 3

This report prepares data for use in Part 3 -- Fringe Benefits for Full-Time Instructional Faculty. It contains name, social security number, rate, calculated fringe benefits in seven areas and total fringe benefits. The seven fringe benefits are: FICA, medical insurance, life insurance, retirement, disability insurance, unemployment insurance and workmen's compensation.

The following factors must be supplied to calculate fringe benefits:

1) FICA rate & Base salary (ex. 6.13% of 1st 22,900)
2) Medical Insurance (ex. $372)
3) Life insurance (ex. .61% of salary)
4) Retirement (ex. 8.5% of salary)
5) Unemployment Compensation (ex. .75% of salary)
6) Disability Income (ex. .66% of salary)

---

*See remarks on page MI40 of the Personnel User Manual concerning the calculation of the Salary Interval.

The report is sorted by basis, report rank, and name with headcounts, total salary and total of each fringe benefit printed for changes in basis or rank.

Report 4

Selection:

Part 2 - Salaries for Continuing Faculty may be completed from this report. All selected Budget Positions with ongoing incumbents whose appointment date (EM-EMPLD) is during the current fiscal year are excluded as are all whose appointment basis (BP-BASIS) has changed since last fiscal year.

If the Budgeted Position did not exist last fiscal year or if the current ongoing incumbent was not the ongoing incumbent last year then the Personnel Action for the current ongoing incumbent in effect on May 1 of the previous fiscal year must be examined. If PA-BASIS is not the same as BP-BASIS, then the current ongoing incumbent is rejected. If no Personnel Action exists for the current ongoing incumbent at that time then an exception report is written consisting of position number, social security number and name.

Format:

This report contains name, social security number, percent cross-referenced, current salary (BP-RATE), and last year's salary (BP-RATE or PA-RATE). It is sorted by appointment basis report rank and name where last year's rank (BP-RANK or PA-RANK) is used to derive report rank. Headcounts and total salary for both years are printed for each change in basis or rank.

Report Request

These reports can be obtained by submitting a request form with the following information to Data Control.

Procedure: PCMIHEG

Option 1: Enter the fiscal year of the data

Option 2: Enter the reporting date of the data required for this report. This is usually October 1 of the current calendar year.

Enter as comments the factors used to compute fringe benefits: FICA base amount, FICA percentage, Medical Insurance amount, Retirement percentage, Unemployment Compensation percentage, Workmen's Compensation percentage, Disability Income percentage, and Life Insurance percentage.

10/18/79
PCMIHEG-1

SALARIES & TENURE OF FULL-TIME INSTRUCTIONAL FACULTY

ACADEMIC YEAR APPOINTMENT BASIS

SEX = FEMALE

RANK = ASSISTANT PROF

EMPLOYEE NAME	SOCIAL SECURITY NUMBER	PERCENT CROSS-REFERENCE	SALARY RATE	TENURE
BERKLER,MARGO	480-62-4990	100.00	16,848.00	
BIAGGIO,MARY KAY	327-46-7456	100.00	16,910.40	
DUPREE,MARY H	270-42-5396	100.00	14,913.60	
FORBES,ROSE L	161-32-1975	100.00	16,785.60	1
HAAGENSEN,H LYNNE	159-42-5898	100.00	15,974.40	
HAAS,JUDITH A	266-40-2696	100.00	12,355.20	
HAHN,SANDRA L	539-38-2233	100.00	17,097.60	
JONES,JOANN C	293-40-7074	100.00	15,288.00	
KELLY,GWENDOLYN N	522-48-0527	100.00	16,972.80	
KESSLER,WINIFRED B	559-72-1033	50.00	17,846.40	
LAPEYRE,ELISABETH	343-36-7376	100.00	16,536.00	
MAHONEY,MARIANNE C	286-48-7374	100.00	14,352.00	
MICHEL,ELINOR L	532-38-3591	100.00	15,537.60	
SCHAEFFER,GOODWIN	079-38-1538	100.00	14,913.60	
SLADE-PRIVETTE,SANDRA	531-42-7255	100.00	17,409.60	
WANAMAKER,NANCY J	375-44-9531	100.00	16,099.20	
WINDHOVER,RUTH RUSHTON	288-40-6934	100.00	15,288.00	
			271,128.00	1
	17			

RANK = ASSOCIATE PROF

EMPLOYEE NAME	SOCIAL SECURITY NUMBER	PERCENT CROSS-REFERENCE	SALARY RATE	TENURE
BARNES,DOROTHY T	518-24-1198	100.00	19,531.20	1
CHAPIN,ZAYE	571-28-7556	100.00	21,590.40	1
DACRES,GERALDINE F	534-18-8736	100.00	21,715.20	1
FORIYES,KATHERYN M	323-36-0492	100.00	19,219.20	1
GEORGE,JUDITH D	342-30-9884	100.00	19,656.00	
HEFFRON,FLORENCE A	093-34-3970	100.00	17,721.60	1
HOFMANN,CATHERINE A	534-38-0325	100.00	20,155.20	1
HULTSTRAND,BONNIE J	477-40-5904	100.00	15,662.40	
KESSEL,ELIZABETH M	389-26-1333	100.00	19,593.60	1
KIEHN,SHIRLEY O	536-18-0241	50.00	18,595.20	1
LASSEY,MARIE L	258-52-0446	100.00	19,156.80	
LUSCHNIG,CECELIA E	127-32-5709	100.00	17,534.40	
MEDSKER,SHIRLEY R	362-42-4658	100.00	18,033.60	1
MENDOZA,NANCY L	390-26-6828	100.00	17,472.00	1
MILLER,LAURA J	539-24-5970	50.00	17,472.00	1
SHURR,GEORGIA H	238-66-0363	100.00	18,532.80	1
WALKER,DIANE B	100-32-5344	100.00	20,280.00	1
WANG,YA-YEN	124-28-6147	100.00	21,528.00	1
WILLIAMS,GAIL A	306-42-9537	100.00	19,843.20	1
WOLF,VIRGINIA	306-22-7817	100.00	19,780.80	1
			383,073.60	16

10/18/79
PCMIHEG-1

SALARIES & TENURE OF FULL-TIME INSTRUCTIONAL FACULTY

ACADEMIC YEAR APPOINTMENT BASIS

SEX = FEMALE

EMPLOYEE NAME	SOCIAL SECURITY NUMBER	PERCENT CROSS-REFERENCE	SALARY RATE	TENURE

RANK = ASSOCIATE PROF

20

RANK = INSTRUCTOR

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10/18/79                               SALARIES OF FULL-TIME INSTRUCTIONAL FACULTY                        PAGE 1
PCMIHEG-2                                        BY SALARY INTERVAL

                                            ACADEMIC YEAR APPOINTMENT BASIS
  SEX       = FEMALE
  RANK      = ASSISTANT PROF
--------------------------------------------------------------------------------------------------------------------
              EMPLOYEE                   SOCIAL      PERCENT      SALARY
                NAME                    SECURITY     CROSS-        RATE
                                         NUMBER     REFERENCE
--------------------------------------------------------------------------------------------------------------------
  INTERVAL = 12,000 TO 12,499

  HAAS,JUDITH A                        268-46-2696    100.00     12,355.20

                                                  1

  INTERVAL = 14,000 TO 14,499

  MAHONEY,MARIANNE C                   286-48-7374    100.00     14,352.00

                                                  1

  INTERVAL = 14,500 TO 14,999

  DUPREE,MARY H                        270-42-5396    100.00     14,913.60
  SCHAEFER,GOODWIN                     079-38-1538    100.00     14,913.60

                                                  2

  INTERVAL = 15,000 TO 15,499

  JONES,JOANN C                        293-40-7074    100.00     15,288.00
  WINDHOVER,RUTH RUSHTON               288-40-6934    100.00     15,288.00

                                                  2

  INTERVAL = 15,500 TO 15,999

  HAAGENSEN,H LYNNE                    159-42-5898    100.00     15,974.40
  MICHEL,ELINOR L                      532-38-3591    100.00     15,537.60

                                                  2

  INTERVAL = 16,000 TO 16,499

  WANAMAKER,NANCY J                    375-44-9531    100.00     16,099.20

                                                  1

  INTERVAL = 16,500 TO 16,999
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10/18/79                SALARIES & TENURE OF FULL-TIME INSTRUCTIONAL FACULTY                 PAGE 11
PCMIHEG-1
                                          FISCAL YEAR APPOINTMENT BASIS
SEX        = MALE
-----------------------------------------------------------------------------------------------------
               EMPLOYEE                      SOCIAL        PERCENT        SALARY     TENURE
                 NAME                       SECURITY       CROSS-          RATE
                                             NUMBER       REFERENCE
-----------------------------------------------------------------------------------------------------

RANK       = ASSISTANT PROF

FOSTER,RICHARD M                           482-66-4692     50.00       20,404.80
NORTON,COLIN                               519-80-1786     80.00       19,843.20
PALS,DOUGLAS                               482-58-5978     50.00       23,025.60
REMINGTON,STEVEN J                         471-60-6769    100.00       15,225.60
RIESENBERG,LOUIS E                         482-50-4513     50.00       22,027.20
THOMAS,VERL M                              542-52-8708     70.00       19,656.00
VAN HECKE,C PARKER                         585-22-0929     50.00       19,344.00

                                                                      139,526.40
                                                  7

RANK       = ASSOCIATE PROF

BLANK,ROBERT H                             395-40-9524    100.00       26,832.00       1
BUSCH,JOHN R                               521-62-3911     50.00       26,956.80       1
BYERS,C RANDALL                            519-54-9430    100.00       28,454.40       1
FAZIO,JAMES R                              194-32-9246     50.00       28,017.60       1
A FOSTER,DAVID E                           506-46-3741     50.00       24,024.00
GENTRY,DALE                                518-42-6505    100.00       23,899.20
HEIMSCH,RICHARD C                          461-68-3617     75.00       22,339.20       1
HENDERSON,DOUGLASS M                       550-52-4629     81.81       22,401.60       1
HOFSTRAND,ARLAND D                         535-18-4602     50.00       24,710.40       1
JONES,HAROLD L                             304-22-3315    100.00       29,764.80       1
KAUS,PAUL F                                518-24-6839     50.00       27,830.40       1
PETERSON,STEVEN R                          395-42-8356     50.00       26,020.80       1
RICHARDSON,THOMAS E                        517-42-5120    100.00       34,694.40
SIPAHIGIL,TEOMAN                           315-42-5041    100.00       23,649.60       1
STEINHORST,R KIRK                          433-64-0005     75.00       25,833.60
WILLIAMS,LARRY G                           518-34-6913    100.00       27,206.40       1

                                                                      422,635.20      12
                                                 16

RANK       = INSTRUCTOR

MAKI,STEPHEN M                             518-52-6430     50.00       17,035.20

                                                                       17,035.20
                                                  1

RANK       = PROFESSOR

ADAMS,DAVID L                              446-38-8358     50.00       32,884.80       1
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10/18/79                SALARIES & TENURE OF FULL-TIME INSTRUCTIONAL FACULTY                 PAGE 12
PCMIHEG-1
                                          FISCAL YEAR APPOINTMENT BASIS
SEX        = MALE
-----------------------------------------------------------------------------------------------------
               EMPLOYEE                      SOCIAL        PERCENT        SALARY     TENURE
                 NAME                       SECURITY       CROSS-          RATE
                                             NUMBER       REFERENCE
-----------------------------------------------------------------------------------------------------

RANK       = PROFESSOR

ANDEREGG,DOYLE E                           294-28-2737     75.00       34,569.60       1
BARNES,WILLIAM P                           519-12-5576    100.00       36,504.00       1
BECK,SIDNEY M                              528-18-5757     65.00       28,641.60       1
BLANTON,PAUL L                             534-22-6636    100.00       35,505.60       1
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10/18/79
PCMIHEG-4

SALARIES FOR CONTINUING FACULTY
BY LAST YEARS RANK

ACADEMIC YEAR APPOINTMENT BASIS

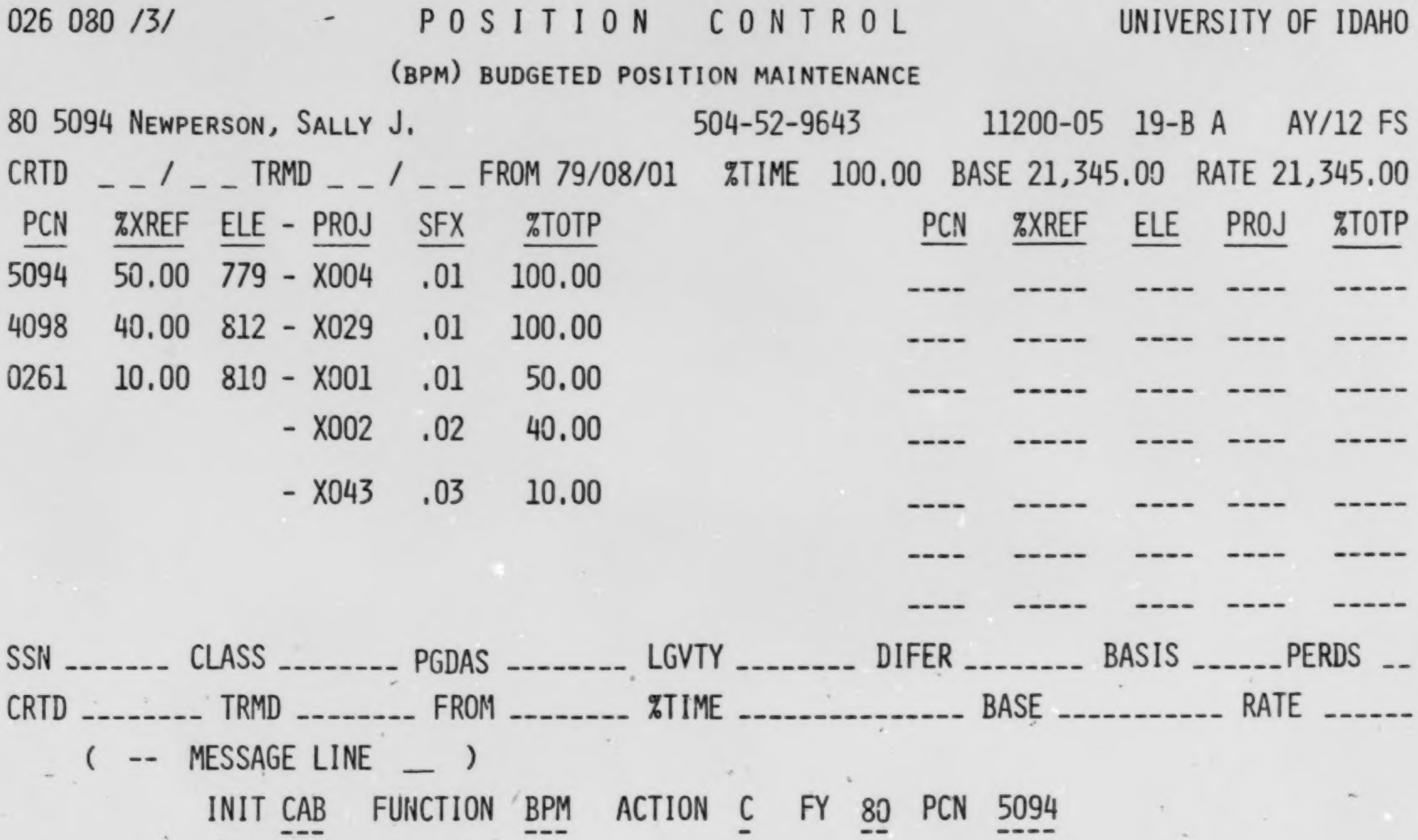
RANK = ASSISTANT PROF

EMPLOYEE NAME	PA-OR-BP	SOCIAL SECURITY NUMBER	PERCENT CROSS-REFERENCE	SALARY RATE	RATE LAST FY
ENGELHARDT, JAMES ALLAN	BP	532-42-1687	100.00	16,536.00	15,412.80
HAAGENSEN, H LYNNE	BP	159-42-5898	100.00	15,974.40	14,227.20
BOWLER, WILLIAM B JR	PA	519-40-5739	100.00	17,035.20	15,849.60
EDER, ANTON A	BP	559-54-0076	100.00	18,595.20	17,160.00
SLADE-PRIVETTE, SANDRA	BP	531-42-7255	100.00	17,409.60	16,224.00
BARON, ROBERT M	BP	544-58-1662	100.00	18,345.60	16,099.20
GIESE, DAVID	BP	476-48-0229	100.00	16,224.00	15,225.60
WOOD, THOMAS	BP	373-52-5129	100.00	18,532.80	17,097.60
MORABITO, DANIEL G	BP	385-48-3873	100.00	18,844.80	17,659.20
NASKALI, RICHARD J	BP	286-30-0699	100.00	18,595.20	17,659.20
CLOUD, JOSEPH	BP	233-68-4166	100.00	16,660.80	15,350.40
WHITE, ROBERT D	BP	523-56-2789	100.00	16,910.40	15,537.60
FARWELL, SHERRY D	BP	517-48-9169	100.00	19,281.60	17,659.20
KLUETZ, MICHAEL D	BP	387-52-7962	100.00	17,659.20	16,161.60
RICHMAN, JACK F	BP	312-46-1747	100.00	17,596.80	16,660.80
JENNESS, TOM F	BP	502-36-7118	100.00	18,283.20	16,473.60
ALLEY, HENRY M	BP	537-40-1822	100.00	16,161.60	14,726.40
SCHAEFER, GOODWIN	BP	079-38-1538	100.00	14,913.60	13,603.20
WINDHOVER, RUTH RUSHTON	BP	288-40-6934	100.00	15,288.00	13,977.60
LAPEYRE, ELISABETH	BP	343-36-7376	100.00	16,536.00	15,225.60
JENSEN, ALFRED W	BP	519-40-8610	100.00	17,846.40	16,411.20
ROSE, ALAN	BP	090-38-0164	100.00	16,536.00	15,100.80
REECE, JAMES R	BP	548-62-4303	100.00	16,848.00	15,412.80
SURLES, ROBERT L	BP	571-50-0261	100.00	17,409.60	15,537.60
HENBERG, MARVIN	BP	520-56-0889	100.00	14,976.00	13,790.40
JONES, JOANN C	BP	293-40-7074	100.00	15,288.00	14,227.20
FORBES, ROSE L	BP	161-32-1975	100.00	16,785.60	15,724.80
WANAMAKER, NANCY J	BP	375-44-9531	100.00	16,099.20	14,851.20
JOHANSEN, HARRY ALLEN	BP	393-46-5970	100.00	16,348.80	15,288.00
MAUCHLEY, G JAY	BP	529-70-9205	100.00	12,916.80	12,043.20
COLE, J ROGER	BP	536-56-5582	100.00	14,539.20	13,728.00
HARBAUGH, JOHN	BP	481-72-8070	100.00	12,979.20	12,043.20
BUKVICH, DANIEL J	PA	517-62-6482	100.00	13,291.20	12,355.00
DUPREE, MARY H	BP	270-42-5396	100.00	14,913.60	13,915.20
HAHN, SANDRA L	BP	539-38-2233	100.00	17,097.60	13,915.20
MAHONEY, MARIANNE C	BP	286-48-7374	100.00	14,352.00	13,041.60
MCFEELEY, NEIL D	BP	081-38-7230	100.00	15,849.60	14,414.40
BIAGGIO, MARY KAY	BP	327-46-7456	100.00	16,910.40	14,539.20
BEESON, RICHARD W	BP	525-74-2442	100.00	19,531.20	18,595.20
LASSEY, MARIE L	BP	258-52-0446	100.00	19,156.80	17,160.00
JENSEN, ERIC L	BP	535-46-7540	100.00	15,724.80	14,289.60
GRIGSBY, THOMAS L	BP	562-46-2649	100.00	15,100.80	13,852.80
UTZMAN, GLEN G	BP	538-36-4407	100.00	23,212.80	20,529.60
PAULSEN, NEIL	PA	553-54-8888	100.00	17,908.80	17,035.20
DAHANPOUR, FARAMARZ	BP	578-72-7532	100.00	22,027.20	19,531.20
WEGMAN, JERRY L	BP	105-34-6573	100.00	20,841.60	18,907.20
TERPSTRA, DAVID E	BP	535-54-1474	100.00	18,532.80	17,284.80

APPENDIX II

Sample Screen Format - Budgeted Position Maintenance

The following material is the documentation included in the users' manual showing the screen format for on-line updating of budgeted positions. It also describes the edits and on-line messages associated with this specific activity.



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026 080 /3/          -      P O S I T I O N   C O N T R O L             UNIVERSITY OF IDAHO
                              (BPM) BUDGETED POSITION MAINTENANCE
80 5094 NEWPERSON, SALLY J.                          504-52-9643      11200-05  19-B A    AY/12 FS
CRTD  _ _ / _ _ TRMD _ _ / _ _ FROM 79/08/01  %TIME  100.00  BASE 21,345.00  RATE 21,345.00
 PCN   %XREF  ELE - PROJ   SFX    %TOTP                         PCN   %XREF   ELE   PROJ   %TOTP
5094   50.00  779 - X004   .01   100.00                         ----  -----   ----  ----   -----
4098   40.00  812 - X029   .01   100.00                         ----  -----   ----  ----   -----
0261   10.00  810 - X001   .01    50.00                         ----  -----   ----  ----   -----
                  - X002   .02    40.00                         ----  -----   ----  ----   -----
                  - X043   .03    10.00                         ----  -----   ----  ----   -----
                                                                ----  -----   ----  ----   -----
                                                                ----  -----   ----  ----   -----
SSN _______ CLASS ________ PGDAS ________ LGVTY ________ DIFER ________ BASIS ______PERDS __
CRTD ________ TRMD ________ FROM ________ %TIME _______________ BASE ___________ RATE ______
    ( -- MESSAGE LINE  __  )
             INIT CAB   FUNCTION  BPM   ACTION  C   FY  80  PCN  5094
```

ON-LINE MESSAGES

BPM-SCREEN

MESSAGE	EXPLANATION	ACTION BY SYSTEM	USER RESPONSE
ALL PCNs MUST BE UNIQUE	When cross-referencing (Action=R) all PCNs to be cross-referenced have to be different.	Invalid fields are highlighted.	Correct duplicate PCNs; press ENTER.
ALL PROJ MUST BE UNIQUE	For any one Budgeted Position all associated projects (BP-PROJ) must be unique.	Invalid fields are highlighted.	Correct un-unique PROJ(s); press ENTER.
BUDGETED POSITION IS ALREADY CROSS-REFERENCED	A Budgeted Position has to be cross-referenced all at one time.	Previous screen is returned.	Uncouple and re-cross-reference.
BUDGETED POSITION NOT FOUND	No Budgeted Position was found for specified key.	Previous screen is returned.	Correct PCN; press ENTER.
CHANGE NOT ALLOWED--MUST BE PRECEDED BY INQUIRY	An attempt was made to update a record without first displaying that record.	Previous screen is returned.	Re-code ACTION, press ENTER.
CLASS REQUIRED ON AN ADD	Class was not coded, yet is required.	Invalid fields are highlighted.	Code in CLASS; press ENTER.
CORRECT HIGHLIGHTED FIELDS	Any field that is invalid or required and missing will be in high intensity.	Invalid fields are highlighted.	Corect the fields that are highlighted; press ENTER.

%TIME: Required on an "Add" (ACTION=A) and on a "Cross-reference" (ACTION=R). If coded, it must be numeric with two decimal places.

%TOTP: Required on an "Add" (ACTION=A) and prohibited on a "Cross-reference" (ACTION=R). If coded, it must be numeric with two decimal places.

BPM SCREEN Cont'd

MESSAGE	EXPLANATION	ACTION BY SYSTEM	USER RESPONSE
%XREF:	Required on an "Add" (ACTION=A) and "Cross-reference" (ACTION=R). If coded, it must be numeric with two decimal places.		
BASE:	Required on an "Add" (ACTION=A) and on a "Cross-reference" (ACTION=R). If coded, It must be numeric with two decimal places.		
BASIS:	Required on an "Add" (ACTION=A). If coded, it must be either 'AY', 'FY', or 'SS'.		
CRTD:	Required on an "Add" (ACTION=A). If coded, it must be a valid date in the form of yy/mm and within the current fiscal year. A value of 'X' is invalid on an "Add". On any other action this will blank out CRTD on the file.		
DIFER:	On an "Add" (ACTION=A) an 'X' is invalid. If an 'X' is coded DIFER will be blanked out on the file. Any other value coded must be a valid code from the PNDIFER table.		
ELE:	Required on an "Add" (ACTION=A) and prohibited on a "Cross-reference" (ACTION=R).		
LGVTY:	Required on an "Add" (ACTION=A). If coded, it must have a value of A thru E.		
PAYGD:	Must be numeric between 09 and 50.		
PAYST:	Must be between "A" and "G".		
PCN:	Required on an "Add' (ACTION=A) and "Cross-reference" (ACTION=R). If coded, it must be numeric.		
PERDS:	Required on an "Add" (ACTION=A). If coded, it must be a value in the range of 01 to 12.		
PROJ:	Required on an "Add" (ACTION=A) and prohibited on a "Cross-reference" (ACTION=R).		
RATE:	Required on an "Add" (ACTION=A) and on a "Cross-reference" (ACTION=R). If coded, it must be numeric with two decimal places.		
SFX:	Required on an "Add" (ACTION=A) and prohibited on a "Cross-reference" (ACTION=R). If coded, it must be numeric with two decimal places.		
SSN:	If coded, the first character can be either alphabetic or numeric; the remaining characters must be numeric.		
TRMD:	Required on an "Add" (ACTION=A). A value of 'X' is invalid if an "Add" transaction. If coded, it must be a valid date in the form of yy/mm.		
CROSS-REFERENCE NOT ALLOWED -- MUST BE PRECEDED BY INQUIRY	An attempt was made to update a record without first displaying that record.	Previous screen is returned.	Re-code ACTION, press ENTER.
DELETE NOT ALLOWED -- BUDGETED POSITION NOT FOUND	No Budgeted Position was found for the specified key.	Previous screen is returned.	Correct PCN; press ENTER.

BPM SCREEN Cont'd

MESSAGE	EXPLANATION	ACTION BY SYSTEM	USER RESPONSE
DELETE NOT ALLOWED -- MUST BE PRECEDED BY INQUIRY	An attempt was made to update a record without first displaying that record.	Previous screen is returned.	Re-code ACTION; press ENTER.
DELETE NOT ALLOWED -- OPERATING POSITIONS FOUND	Cannot delete a Budgeted Position that has an associated Operating Position.	Previous screen is returned.	Delete OP's first, then BP.
DELETE NOT ALLOWED -- XREF PCNS EXISTS	Cannot delete a Budgeted Position that is cross-referenced.	Previous screen is returned.	Uncouple PCNS and then Delete.
DELETE NOT SUCCESSFUL	The Budgeted Position was not deleted from the file.	Previous screen is returned.	Display the record and try delete again.
DELETE PROCESSED SUCCESSFULLY	The Budgeted Position has been deleted from the file.	New screen is is returned.	Continue processing.
ELEMENT CHANGE NOT ALLOWED WHEN OP(S) EXIST	An attempt was made to change the element of a Budgeted Position which has an associated OP segment.	Previous screen is returned.	Delete the OP segment and try again.
IDENTICAL ELE(S) & %XREF(S) REQUIRED	All ELE & %XREF code should be the same for any one Budgeted Position.	Invalid fields are highlighted.	Adjust ELE and/or %XREF; press ENTER.
INCONSISTENT BC/MJ/MN CODES	The ele/proj derived different BC/MJ/MN from the P4 table.	Invalid fields are highlighted.	Determine the appropriate BC/MJ/MN and adjust ele/proj accordingly; press ENTER.
INQUIRY NOT SUCCESSFUL -- BUDGETED POSITION NOT FOUND	No Budgeted Position segment was found for the specified key.	Previous screen is returned.	Enter the correct key for the Budgeted Position required.

MESSAGE	EXPLANATION	ACTION BY SYSTEM	USER RESPONSE
INVALID ACTION CODE	A code that was entered for action is not recognized.	Previous screen is returned.	Determine a valid action code- code it in; press ENTER.
INVALID BC	The Budget Control code derived from the ele/proj lookup in P4 table could not be found in the BC table.	Invalid fields are highlighted.	Contact the Controller's Office; continue with any other processing.
INVALID ELE/ PROJ(S)	The highlighted ele/proj could not be found in the P4 table.	Invalid fields are highlighted.	Determine appropriate code, enter it; press ENTER.
INVALID RANK	The rank code entered could not be found in the PNRANK table.	Invalid fields are highlighted.	Determine the appropriate code; code it in, press ENTER.
INVALID TITLE	The title code entered could not be found in the PNTITLE table.	Invalid fields are highlighted.	Determine the appropriate title code; code it in; press ENTER.
MISSING OR NON-NUMERIC KEYS	Both FY & PCN must be present and numeric.	Previous screen is returned.	Code appropriate FY and PCN; press ENTER.
MISSING PROJECT DATA	Fields filled with asterisks are required.	Invalid fields are highlighted.	Code appropriate missing data; press ENTER.
MORE THAN 15 PROJECTS IN ALL XREFS	Total number of projects allowed between XR-PCNs is 15.	Previous screen is returned.	Delete some projects thru "change" or re-evaluate the present transaction.
NO XREF PCNS ENTERED	Action=R, yet no cross-reference PCNs were entered.	Previous screen is returned.	Code XR-PCNS; press ENTER.
NOT ALL XREFS REFERENCED	All PCNs displayed must appear on update side of screen.	Previous screen is returned.	Correct update PCNs; press ENTER.
PAYST REQUIRED WITH PAYGD	When PAYGD is coded, PAYST must be coded.	Invalid fields are highlighted.	Code PAYST; press ENTER.
PAYGD REQUIRED WITH PAYST	When PAYST is coded, PAYGD must be coded.	Invalid fields are highlighted.	Code PAYGD; press ENTER.

BPM SCREEN Cont'd

MESSAGE	EXPLANATION	ACTION BY SYSTEM	USER RESPONSE
PCN ALREADY EXISTS	An attempt was made to add an already existing PCN.	Previous screen is returned.	Correct PCN; press ENTER.
PCN NOT FOUND	No Budgeted Position was found for the specified key.	Previous screen is returned.	Correct PCN; press ENTER.
PRIMARY PCN NOT ENTERED ON FIRST LINE	The key PCN must be the same as first one entered on the update screen.	Previous screen is returned.	Code primary PCN on the first line; press ENTER.
PROHIBITED PROJECT FIELDS FOUND	The highlighted fields are not allowed.	Invalid fields are highlighted.	Blank out all highlighted fields; press ENTER.
RANK ILLEGAL WITH CLASSIFIED TITLE	Persons with a PAYGD cannot also have a rank.	Invalid fields are highlighted.	Blank out the rank coded; press ENTER.
REQUIRED PROJECT FIELD MISSING	Those fields with highlighted asterisks are required.	Invalid fields are highlighted.	Code values for highlighted fields; press ENTER.
SUM OF %TOTP FOR ONE OR MORE PCNS NOT = 100.00	%TOTP must be 100.00 for each Budgeted Position.	Previous screen is returned.	Correct percentages and press ENTER.
TITLE REQUIRED WHEN PGD&S CODED	PGD&S was coded, however title was not.	Invalid fields are highlighted.	Code title; press ENTER.
TITLE REQUIRED WITH RANK	Title code was blank and the rank code was valid.	Invalid fields are highlighted.	Code title; press ENTER.
TITLE REQUIRES BLANK PGD&S	The title coded cannot have an associated PGD&S.	Invalid fields are highlighted.	Blank out PGD&S; press ENTER.
TITLE REQUIRES PGD&S	Title was coded, however PGD&S was not.	Invalid fields are highlighted.	Code PGD&S; press ENTER.
TITLE REQUIRES RANK	The group code gotten from the PNTITLE table was '**' thus rank should be coded.	Invalid fields are highlighted.	Code rank; press ENTER.

BPM SCREEN Cont'd

MESSAGE	EXPLANATION	ACTION BY SYSTEM	USER RESPONSE
TOTAL %TOTP NOT 100.00	The sum of %TOTP must be 100.00 for a new position.	Previous screen is returned.	Correct the %TOTP(s) in error; press ENTER.
TOTAL %XREF IS NOT 100.00	The sum of %XREF's for all cross-referenced Budgeted Positions must be 100.00	Previous screen is returned.	Adjust %XREF(s) so that it adds up to 100.00; press ENTER
UNCOUPLE NOT ALLOWED -- BP IS NOT CROSS-REFERENCED	Can only uncouple cross-referenced PCNs.	Previous screen is returned.	Check the key for correctness.
UNCOUPLE NOT ALLOWED -- BUDGETED POSITION NOT FOUND	No Budgeted Position was found for specified key.	Previous screen is returned.	Correct PCN; press ENTER.
UNCOUPLE NOT ALLOWED -- MUST BE PRECEDED BY INQUIRY	An attempt was made to update a record without first displaying that record.	Previous screen is returned.	Re-code ACTION; press ENTER.
UNCOUPLE NOT SUCCESSFUL	The Budgeted Positions were not uncoupled.	Previous screen is returned.	Display record and try again.
UNCOUPLE SUCCESSFULLY PROCESSED	Budgeted Positions now uncoupled on file.	Record displayed.	Continue processing.
UNXREFED PCN REFERENCED	All PCNs displayed must appear on update side of screen.	Invalid fields are highlighted.	Correct PCNs; press ENTER.
XREF PCN IS ALREADY CROSS-REFERENCED	Cannot cross-reference PCNs that are already cross-referenced.	Invalid fields are highlighted.	Uncouple and Re-cross-reference.
XREF PCN NOT FOUND	A PCN to be cross-referenced could not be found.	Invalid fields are highlighted.	Correct the offending PCN; press ENTER.

BPM SCREEN Cont'd

MESSAGE	EXPLANATION	ACTION BY SYSTEM	USER RESPONSE
MAINTENANCE AFTER CUTOFF DATE NOT ALLOWED	An attempt to update a Budgeted Position from the previous fiscal year after October 1, the cutoff date, was rejected.	Previous screen is returned.	Do not attempt maintenance to a Budgeted Position from the previous fiscal year after the cutoff date, October 1 of the current fiscal year.

THE UNIVERSITY OF MICHIGAN PURCHASING SYSTEM

Robert E. Russell
The University of Michigan
Ann Arbor, Michigan

Roxana L. Block
The University of Michigan
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As part of the development of an integrated management information system, The University of Michigan recently designed and installed an on-line Purchasing System. The implementation of this system has helped lay the groundwork for further development of financial systems at The University of Michigan. At the same time, it has provided Purchasing with information about their operation that has lead to more efficient procedures, better service to the campus, improved vendor relations, and an increased ability to respond to changing requirements. This paper discusses administrative systems development at The University of Michigan, the on-line Purchasing System, its impact on Purchasing operations, and how it will contribute to increased management effectiveness in the 1980s.

> *Society's commitment to higher education is a mandate to the institution to use its resources for purposes of great social importance. The task of college and university management is to insure the wise and most effective use of resources for such purposes.*
>
> *NACUBO*

Higher education will face many challenges throughout the 1980s. On the eve of the new decade, forecasts of declining student enrollments, inflation, tax limitation legislation, and increased requirements for reporting and accountability make the task of higher education management more difficult. Three of these forces will work together to compound the difficulties of the future. Reduced enrollments, inflation, and tax limitation legislation will severely limit institutional resources. Effective resource management, then, will be an important factor in institutional survival during the 1980s.

The goal of The University of Michigan's Office of Administrative Systems is to provide computer-based support for the administrative operations of the University. To reach this goal, the development of an integrated management information system is underway. This management information system will provide the means for effective resource management to help The University of Michigan meet the challenges facing higher education in the 1980s.

Part I. Development of Administrative Systems

Planning for management information systems at The University of Michigan began in 1966 with the recommendation for the creation of a central data bank. In 1969, a campus committee recommended the creation of an organizational structure to direct the development of campus-wide information systems.

Framework for Development

The Office of Administrative Systems was established and given the responsibility for administrative systems. The objective of this office is:

> *To implement the concept of data as a University resource, and to provide management at all levels for all University units with the information systems necessary for the effective utilization of University resources.*[1]

The effort to reach this objective consists of three parts:

1. The effort to keep pace with the changes in computer technology.
2. The effort to solve the management problems resulting from a more pervasive relationship between computerized systems and administrative decision making.
3. The effort to develop useful systems using data base technology.[2]

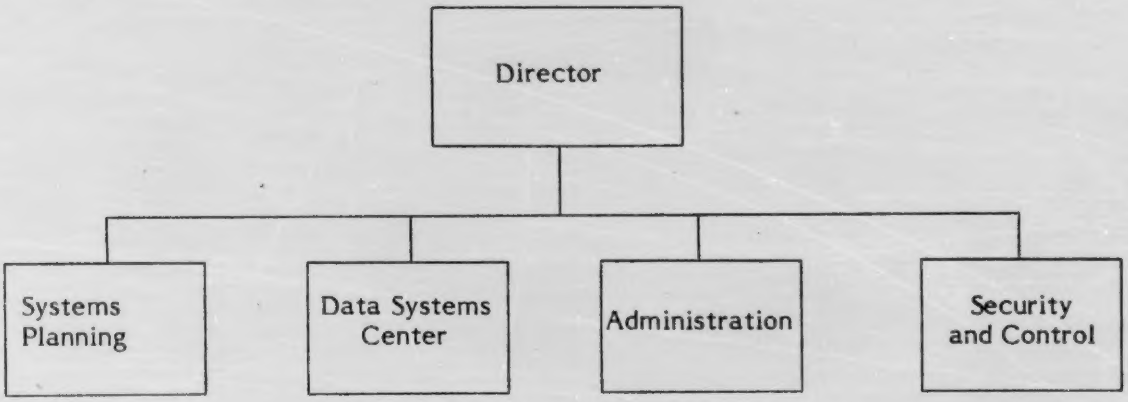
This effort is directed primarily through two subordinate units - the Data Systems Center and the Office of Administrative Systems Planning (see Figure 1). The Data Systems Center develops and operates computer-based information systems. It employs a staff of approximately 60 analysts and programmers divided into three broad functional areas: financial, personnel, and student systems. Programs are coded in PL/1 using IBM's Information Management System (IMS) for data base applications. The Data Systems Center operates an IBM 3032 with four megabytes of memory, and processes up to 55,000 on-line transactions daily.

The Office of Administrative Systems Planning assesses the administrative information needs of all university units and recommends the use of the centralized development services provided by the Office of Administrative Systems. To insure user and management involvement, the development of administrative systems is under the direction of working groups (see Figure 2) composed of user personnel in middle and high level administrative positions and Data Systems Center personnel. The Office of Administrative Systems Planning plans and coordinates the systems development activities of these working groups through three Managers of Systems Planning, each responsible for a specific application area.

The University of Michigan

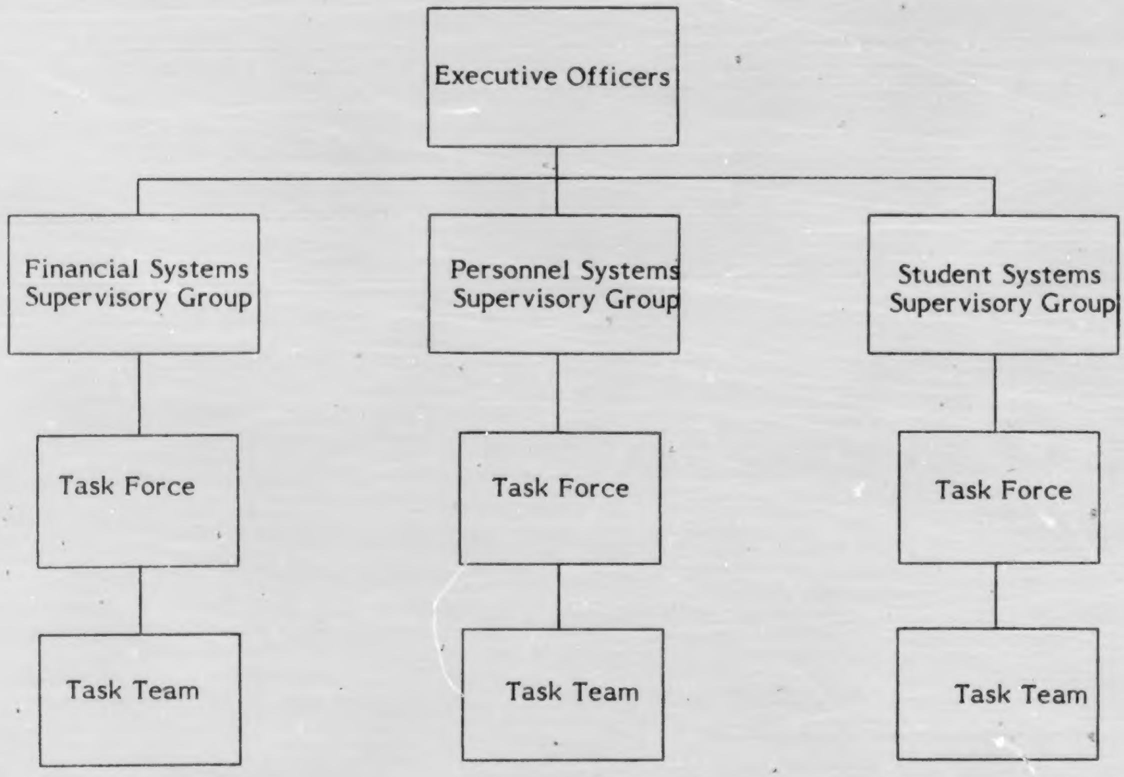
Office of Administrative Systems

Figure 1


Director
Systems Planning
Data Systems Center
Administration
Security and Control

Project Development Organization

Figure 2


Executive Officers
Financial Systems Supervisory Group
Personnel Systems Supervisory Group
Student Systems Supervisory Group
Task Force
Task Force
Task Force
Task Team
Task Team
Task Team

A Supervisory Group is established for each functional area to provide general direction for systems development. Their primary function is "to determine priorities among competing projects, to approve the scope of proposed systems, to commit resources to development projects, and to resolve problems concerning policy or organizational structure."[3]

Representatives from user departments form three Task Forces, which are subordinate to each Supervisory Group. Their function is "to receive and review requests for systems development, to consider new and alternative approaches to current and proposed systems, to consolidate development efforts into manageable projects, and to recommend these projects to Supervisory Groups."[4]

The development of each systems project recommended by a Task Force and approved by a Supervisory Group is carried out by a Task Team. Personnel from the user department, the Office of Administrative Systems Planning, and the Data Systems Center comprise each Task Team, and their primary responsibility is to design, pian and implement the system under the general direction of the Task Force. To insure orderly development of each project, the project management procedure requires design documents at specific intervals, audit review of security and controls, and management approval for the commitment of resources.

Progress to Date

Some of the management information system components completed or in progress are on-line student registration, student housing, staff appointments and benefits, alumni development/gift receiving, purchasing, and accounting. Fifty-two user offices interact with these systems over a network of 188 terminal devices utilizing 142 on-line transactions.

The recent completion of an access control facility is making more data available to administrative offices across the campus. This system limits access to data bases and provides the capability to make data available to those with a "need to know". With the development of an integrated management information system well underway, the access control facility places the goal of the Office of Administrative Systems, to consider data as a University resource, within reach.

Part II. An Administrative System: Purchasing

Prior to January of 1978, the Purchasing and Accounts Payable process at The University of Michigan was a totally manual operation. Numerous problems and inadequacies were inherent in this old system. Some of the reasons for a feasibility study for an automated system were:

1. Administrative needs for a management information system.
2. Departmental needs for improved Purchasing and Accounts Payable services.
3. Purchasing's need to interface with the accounting system for efficiency of processing.
4. Purchasing's need to be able to analyze, manage, and control their operation.
5. Recommendations from state and internal auditors to automate operations.

With the implementation of an on-line data base system, the Purchasing and Accounts Payable offices have improved their performance and use of resources.

The System

Upon receipt at a Purchasing office, a requisition is logged onto the system using the requisition number as the key. An inquiring department can be told by any Purchasing office the exact status of their requisition. After being logged in, a requisition is sent to the buyer handling that particular commodity, who reviews it for completeness. The buyer applies various codes, dates, prices, and approvals to the requisition and then sends it to data entry for expense class, shipping address, commodity, and vendor coding. Requisitions are grouped into batches for on-line data entry. Purchase orders are printed at the Data Systems Center each night and delivered to Purchasing for review and distribution to vendors and departments.

Invoices are received by Accounts Payable and grouped into batches for auditing against the purchase order data base. Departmental labels are automatically printed for attaching to a copy of the invoice to be mailed out to the department for payment approval. Invoices of $1000 or more require signature approval for payment. There is an automatic follow-up procedure for delinquent department approvals. Invoices for less than $1000 will be paid in 8 days unless the department requests that payment be delayed. Once a week, approved invoices are removed from the data base and prepared for payment. Vendor checks are written the following day, and paid purchase orders are updated and closed. (For system details, refer to pages 10 through 17.)

Operational Benefits

The centralization of files on the data bases has eliminated the redundant collection and maintenance of data, resulting in reduced and more efficient clerical effort. The requisition, purchase order, vendor and invoice information is accessible to all Purchasing and Accounts Payable offices, the receiving docks, and authorized university departments. Departmental and vendor questions are answered more quickly and with greater accuracy. Excessive paperflow involved in invoice approval and payment has been greatly reduced and invoices are being paid more promptly, resulting in an increase in cash discounts taken. The data base files provide for a more rigorous control and application of credit memos on a University-wide basis. The security and controls of the on-line system make unauthorized purchases and payments less likely.

Information for Management

The potential for management information afforded by an automated system is beginning to be realized. The accumulation of comprehensive statistical data enables the managers of Purchasing and Accounts Payable to better analyze and control their operations. Purchase orders can be analyzed and reported by buyer, vendor, originating department, commodity code, and other useful characteristics. Managers may view the data from many different angles to study trends, locate problems, and plan more efficient methods of operating their offices. Through the use of on-line inquiry packages, timely statisitcal reports based upon the entire open order file can be provided. Activities such as these were tedious or impossible under the manual system.

Four types of management reporting - *operational, problem, historical and informational* - contribute to more effective utilization of resources. *Operational* reporting contains information regarding office performance. Purchasing receives reports showing the volume of activity by entry operator and buyer. Data base studies can determine the average processing time of a requisition, the elapsed time from receipt of invoice to payment, and the total cash discounts lost or taken. This information provides useful parameters to assist management in evaluating the efficiency of their operation.

The automated system is an effective trouble shooter, helping managers analyze and solve *problem* situations. Management can quickly and accurately respond to complaints or questions by departments or vendors regarding service. The reporting facilities provide comprehensive information by vendor or department in a timely fashion.

As management plans for the 1980s, it must strive for more effective ways to perform the functions of Purchasing. Management can analyze trends across a period of time by studying the *historical* files maintained by the new system. Figures on the volume of business with each vendor will enable Purchasing to more effectively bargain for contracts and discounts. Reviewing the data by commodity code provides price analysis information and identifies items which may possibly be stocked in University Stores. With an eye to controlling cost through recharging or setting dollar limits on small purchase orders, management can study volume of service to the University by department, organization, or account.

Informational reporting capabilities have improved Purchasing's ability to respond to special requests for information. Federal, state, and internal auditors can ask for and receive reports which previously were impossible to prepare. Another example of informational reporting was a recent request to report the amount of business done with minority vendors. Once again, this task would have been virtually impossible with the old system.

Conclusion

It is the goal of administrative systems development at The University of Michigan to improve the utilization of University resources. With the implementation of the Purchasing System, the Purchasing and Accounting departments now have the ability to better analyze, manage, and control their operations. The end result is improved procurement of physical resources for the University. As the development of administrative systems continues, more effective utilization of resources to meet the challenges of the 1980s will become a reality at The University of Michigan.

REFERENCES

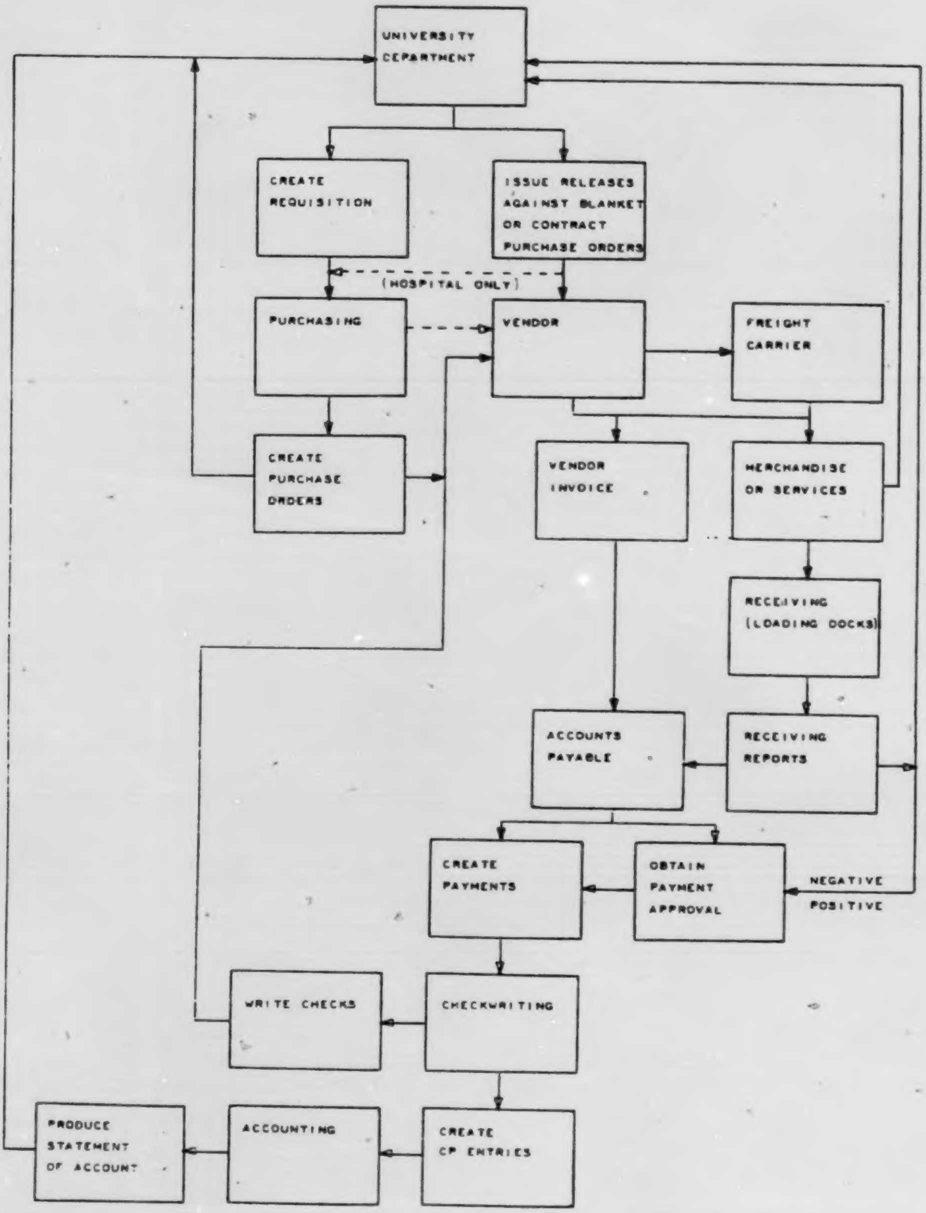
[1] Office of Administrative Systems, Sixth Annual Progress Report and Development Plan (Ann Arbor: The University of Michigan, June, 1979), p. 10.

[2] Office of Administrative Systems, Fifth Annual Progress Report and Development Plan (Ann Arbor: The University of Michigan, June, 1978), p. 2.

[3] Office of Administrative Systems, Project Management Guide (Ann Arbor: The University of Michigan, July 1978), p. 3.

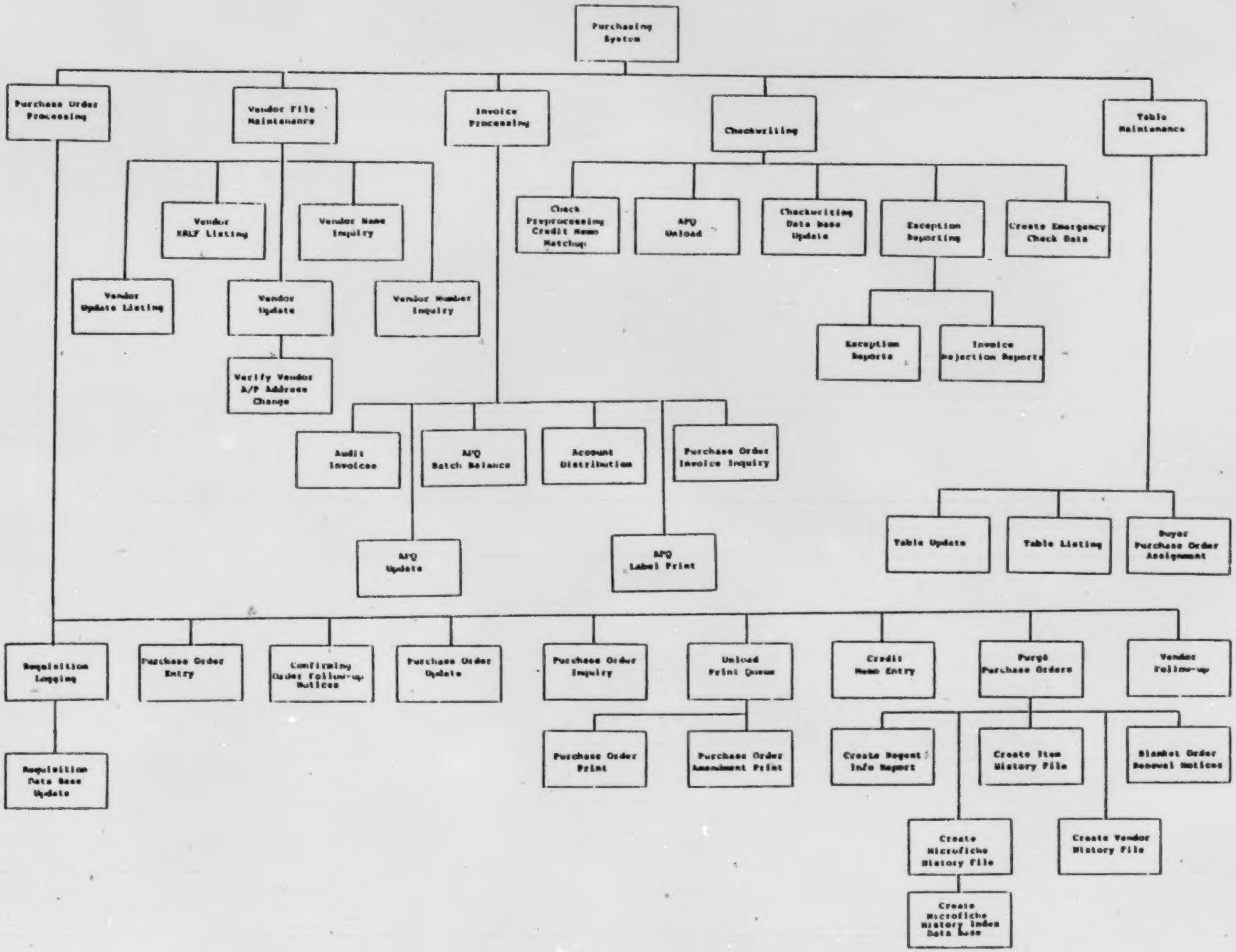
[4] IBID.

The University of Michigan
Overall Functional Flow
Of the Purchasing/Accounts Payable System


UNIVERSITY DEPARTMENT
CREATE REQUISITION
ISSUE RELEASES AGAINST BLANKET OR CONTRACT PURCHASE ORDERS
(HOSPITAL ONLY)
PURCHASING
VENDOR
FREIGHT CARRIER
CREATE PURCHASE ORDERS
VENDOR INVOICE
MERCHANDISE OR SERVICES
RECEIVING (LOADING DOCKS)
ACCOUNTS PAYABLE
RECEIVING REPORTS
CREATE PAYMENTS
OBTAIN PAYMENT APPROVAL
NEGATIVE
POSITIVE
WRITE CHECKS
CHECKWRITING
PRODUCE STATEMENT OF ACCOUNT
ACCOUNTING
CREATE CP ENTRIES

The University of Michigan

PURCHASING SYSTEM HIERARCHIAL CHART


Purchasing System
Purchase Order Processing
Vendor File Maintenance
Invoice Processing
Checkwriting
Table Maintenance
Vendor XALF Listing
Vendor Name Inquiry
Vendor Update Listing
Vendor Update
Vendor Number Inquiry
Verify Vendor A/P Address Change
Check Preprocessing Credit Memo Matchup
APQ Unload
Checkwriting Data base Update
Exception Reporting
Create Emergency Check Data
Exception Reports
Invoice Rejection Reports
Audit Invoices
APQ Batch Balance
Account Distribution
Purchase Order Invoice Inquiry
APQ Update
APQ Label Print
Table Update
Table Listing
Buyer Purchase Order Assignment
Requisition Logging
Purchase Order Entry
Confirming Order Follow-up Notices
Purchase Order Update
Purchase Order Inquiry
Unload Print Queue
Credit Memo Entry
Purge Purchase Orders
Vendor Follow-up
Requisition Data Base Update
Purchase Order Print
Purchase Order Amendment Print
Create Regent Info Report
Create Item History File
Blanket Order Renewal Notices
Create Microfiche History File
Create Vendor History File
Create Microfiche History Index Data Base

The University of Michigan
Purchasing System

Major Program Descriptions

Program Name	Description
PO Inquiry	on-line inquiry by PO number for PO data
PO REQ Inquiry	on-line inquiry by requisition number for PO data
VENNAME Inquiry	on-line inquiry by vendor name to find vendor number
VENINQ	on-line inquiry by vendor number for vendor data and index of orders written to that vendor.
POINV Inquiry	on-line inquiry by PO number for internal PO data and invoice/payment summary
POINV,INV=Inquiry	on-line inquiry by PO and invoice number for detail payment information on a specific invoice
PO Entry	on-line program to enter purchase order data
PO Amendment	on-line program to update PO data
Vendor Update	on-line program to add or change vendor data
Buyer PO Number	on-line program to assign confirming order numbers to buyers
Credit Memo Update	on-line program to add and change credit memo data
Requisition Update	on-line program to add, change, or delete requisition data

Program Name	Description
Purchasing Table	on-line program to add, change, delete, and inquire on table data base data
A/P Audit	on-line program to audit invoices
A/P Batch Balance	on-line program to balance batches of audited invoices
Account/Class Update	on-line program to update account number and expense class on all or selected line items on a purchase order
A/P Label	on-line program to print mailing labels for audited invoices
Account Distribution	on-line program to distribute an invoice payment across multiple accounts and/or expense classes
Verify	on-line program to verify vendor payment address changes
A/P Queue Update	on-line program to update invoice data for balanced batches
Check Messages	on-line transaction to enter special check messages to the vendor
PO Print	batch program to print purchase orders and daily control totals
Amendment Print	batch program to print amended purchase orders and control totals

Program Name	Description
Vendor Activity Report	batch program to print daily audit trail of changes to the vendor data base
Purge	batch program that passes data bases monthly, removing closed orders, creating an historical data file, a microfiche, and an index of purged orders
Order Renewal Notices	batch program that prints postcard renewal notices for expiring blanket and contract purchase orders
Vendor Follow-up	batch program that prints follow-up notices to vendors for orders not yet received or completed
Confirming Order Follow-up	batch program that prints notices to departments requesting requisitions for order numbers assigned in advance
Checkwriting Unload	batch program that removes invoice data from the accounts payable queue data base for checkwriting
Check Print	batch program tc print vendor checks
Check Update	batch program that updates PO data with payment information and closes paid orders
Vendor List	batch program to print master microfiche listing of vendor data base
Buyer/Vendor List	batch program to print selected vendors for an individual buyer

The University of Michigan
Purchasing System

Data Base and File Descriptions

1. Purchase Order Data Base

The purchase order data base contains a record for every outstanding purchase order and for those orders closed within the last two months. The purchase order records are established initially from the purchase requisitions and updated with acknowledgement, follow-up, and invoice information. The file is available for on-line inquiry by Purchasing, Accounts Payable, Checkwriting, and authorized departments.

2. Vendor Data Base

The vendor data base contains a record for all vendors with outstanding orders. The vendor name, order and remit-to addresses, invoice and credit memo information, standard terms, and FOB are the primary data elements recorded. In addition, the purchase order number, order date, and account number for all outstanding purchase orders and for those orders closed within the last two months are also part of this file. This file is available for on-line inquiry by Purchasing, Accounts Payable, Checkwriting, and authorized departments.

3. Vendor Name Data Base

The vendor name data base is used for inquiry by vendor name. It contains records for the vendor's ordering name, remit-to name, and two cross reference names. This permits a maximum of four name variations to reference the same vendor number. Records are established and deleted on this file when vendor names are added, changed, or deleted. It is available for on-line inquiry by Purchasing, Accounts Payable, Checkwriting, and authorized departments.

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4. Requisition Data Base

The requisition data base contains a record for every requisition entered. Prior to the creation of an order from the requisition, the status of the requisition is available for inquiry. After an order is typed, the order data is accessible using the requisition number. Records are deleted from this file when orders are purged. This file is available for on-line inquiry by Purchasing, Accounts Payable, Checkwriting, and authorized departments.

5. Accounts Payable Queue Data Base

The accounts payable queue data base is a perpetual data base containing invoice payment details grouped by batches. Records are established during invoice audit. The batches are purged as invoices are paid. It is available for on-line inquiry by Accounts Payable and Checkwriting.

6. Print Queue Data Base

The print queue data base is the holding file for daily activity. It contains records indicating which orders, amendments, reprints, and vendor activity reports are to be printed. It is updated as orders, amendments, print requests, and vendors are entered. It is purged as the items specified are printed.

7. Table Data Base

The table data base is a series of table records which contain an assortment of Purchasing information (buyer initials, authorized entry operators, ship-to-codes, complaint types, etc.). This file is updated by the Purchasing system control LTERM or Accounts Payable control LTERM. It is available for inquiry by Purchasing, Accounts Payable, and Checkwriting.

8. Microfiche History Index Data Base

This data base is updated as purchase orders are purged. It contains a root segment for every purged purchase order. A lower level segment contains the purge date, microfiche page, and frame. This provides an index by purchase order number to the microfiche reports produced from the purge program.

9. Vendor History File

This file is updated as orders are purged. It is a cumulative file containing one record for each purged purchase order. The vendor name and number is included in this record. It provides a microfiche cross-reference by vendor to purged purchase orders.

10. Item History File

This file is created as orders are purged. It contains a header record and one record for each line item of a purged purchase order and will be used for reporting and analysis in subsequent phases of the Purchasing project.

TADPOLES

A STUDENT COHORT MONITORING SYSTEM

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L. M. BRUSH

THE PENNSYLVANIA STATE UNIVERSITY

UNIVERSITY PARK, PENNSYLVANIA

ABSTRACT

Academic policy has rarely, if ever, directly affected the enhancement or development of information systems in the university setting. TADPOLES responds to information needs for both the setting of policy and the subsequent systematic monitoring. The system is dynamic with a regular updating of a longitudinal data base which provides the basic data to the student cohort monitoring system. The availability and selectability of data at different levels of aggregation and summary provides a powerful tool for analyzing the academic consequences of admissions practices as well as policies.

PREPARED FOR THE 1979
CAUSE NATIONAL CONFERENCE
HELD AT ORLANDO, FLORIDA
NOVEMBER 27-30, 1979

The Admissions Policy Evaluation System
(TADPOLES)

SYSTEM GENESIS

The requirement to effectively *plan* the academic content of courses, the course teaching methods, and the program of student academic advising depend on the academic potential *and* performance of the students being admitted to the institution. A deeper understanding of the impact of admissions policies on the academic performance, persistence or retention, and the intrainstitutional mobility of students is essential to academic planning and policy making.

At The Pennsylvania State University (PSU) as with many colleges and universities, policy determination for curricular affairs, admissions, and student academic performance standards is relegated to a legislative body of faculty members. The University Faculty Senate is charged with the determination of academic policy in these areas at Penn State subject to the approval of the President of the University. *The influence of* this *policy* body on the development and evolution of a longitudinal student data base and the subsequent development of TADPOLES *is somewhat unique* when compared with the manner in which most PSU information systems have been and are being evolved. The absence of academic policy influence may have contributed significantly to the general state of affairs in information systems currently serving institutions of higher education. This weakness has recently been cited by Trotter and Creet[1] who indicate that "information

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[1] Bernard Trotter and Mario Creet, Office of Academic Planning, Queens University, Ontario, Canada. Information Systems: False Premises and "All Purpose Flour." PLANNING FOR HIGHER EDUCATION 6, April 1978.

systems in higher education are in a mess." They ascribe the cited mess to much weight being given to the administrator's view of information systems. Trotter and Creet indicate that administrators "involvement is becoming so considerable that they are not only squeezing out the policy makers and planners but are taking over the function of formulating systems as well."

Until the middle of this decade (early 1976), no formal mechanism existed at Penn State for orderly, systematic influence of information system design and development by the University Faculty Senate. Early in 1976 a formal communication channel to the Office of the Senior Vice President for Administration was established through which the Senate could request basic institutional data. This channel established de facto policy influence on the development of information systems at Penn State. Prior to 1976, the administrators who controlled the data bases as well as those (in some instances the same administrators) responsible for system development, modification, and maintenance had little, if any, conception of the information needs of the academic policy makers (especially the needs of the academic legislature). An early request from the University Faculty Senate was for information to measure the academic consequences of prevailing admissions policies.

GENERAL INFORMATION REQUIREMENTS

The initial Senate interest was two-fold: (1) to derive accurate indices of the basic academic competencies of entering students (the traditional freshman student as well as the non-traditional student) and (2) to monitor the success, retention, and mobility of students.

The first (1) Senate interest was and is being satisfied by processing the available data in the university's admissions file. The second (2) Senate interest influenced the development of a specific data system in that for the first time a significant effort has been mounted specifically to satisfy academic policy information requirements. In the analysis of the information requirements no existing data system was found which could provide for the systematic monitoring required by this second (2) interest. The influence of the Senate has resulted in: (1) the modification of a longitudinal student data base* which is now updated systematically from the transactional student record system and (2) the development of TADPOLES, a processing system designed to monitor the academic performance, persistence, and mobility patterns of entering cohorts of Penn State students.

The initiative for TADPOLES, then, began with an interest of the Senate in the systematic review of the academic consequences of admissions policies governing Penn State's freshmen, advanced standing, provisional, and non-degree students. The development of a system to meet these needs was approved by the 1976 executive decision. The system and the resultant information generated by the system has begun to serve both general and specific interests of academic Department Heads, College Deans, Commonwealth Campus Directors, the Dean of Admissions, and other University administrators as well as the policy-setting

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*The data base (SMART-2) is described in Appendix A.

Senate whose influence was the primary impetus for the system development.

Academic Organization and Environment

The intent of this section is to describe the policy setting and management environment within which TADPOLES operates. Figure 1 shows the organization of the academic units of Penn State. TADPOLES is designed to enable (1) the Commonwealth Campuses, (2) the Academic Departments, (3) the Colleges, (4) the Provost, and (5) the University Faculty Senate to monitor at different levels of summarization and aggregation the academic performance of specified cohorts of students. One goal is to provide commonly-derived data on student performance to the various organizational levels in order to enhance planning for course offerings and requirements and to provide a consistent, systematic set of data for reviewing policy impact. A second goal is to provide the Provost and the Dean of Admissions the same performance data for: (1) monitoring the current admission policies and (2) highlighting specific Colleges or Campuses where grade inflation, instructional effectiveness, and/or student support services (especially academic advising) may require deeper investigation and/or changed to meet the changing predicted and actual performance characteristics of the student population.

At this point in time the data resulting from TADPOLES are not intended to be conclusive but rather suggestive. Discussion and negotiation can and should take place within the academic organization

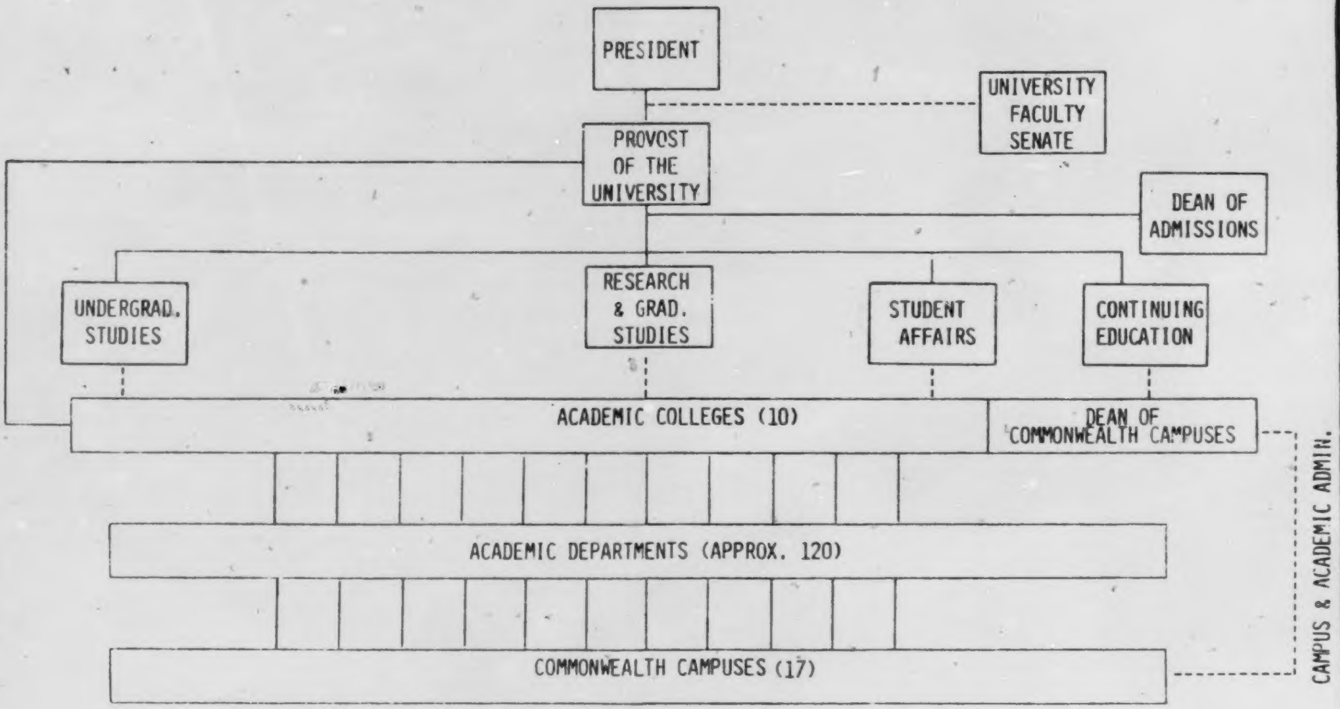
PRESIDENT
UNIVERSITY FACULTY SENATE
PROVOST OF THE UNIVERSITY
DEAN OF ADMISSIONS
UNDERGRAD. STUDIES
RESEARCH & GRAD. STUDIES
STUDENT AFFAIRS
CONTINUING EDUCATION
ACADEMIC COLLEGES (10)
DEAN OF COMMONWEALTH CAMPUSES
ACADEMIC DEPARTMENTS (APPROX. 120)
COMMONWEALTH CAMPUSES (17)
CAMPUS & ACADEMIC ADMIN.

FIGURE 1 - ORGANIZATION OF ACADEMIC UNITS
THE PENNSYLVANIA STATE UNIVERSITY

OPERATIONAL MATTERS ----
ACADEMIC POLICY MATTERS ____

based on the suggestions. The commonality and availability of data available at each organizational level should permit the policy-maker and administrator to concentrate on the overall academic implications of student performance rather than being concerned with reconciliation of two or more sets of independently-derived data. At the same time if the data is determined to be inadequate or inaccurate only one system will require modification to make the necessary corrections. The utility of the system has been enhanced by feedback from the users about the deficiencies and potential added uses of the system. Additional statistical data in the form of summaries have already been added.

GENERAL SYSTEM OBJECTIVES

The objective of the System is to determine, monitor, and report on the academic performance and attendance patterns of entering PSU students. TADPOLES tracks entering freshmen, advanced standing, and campus transfer cohorts of students through their academic career at Penn State, taking a "snapshot" of those students at a specifiable point in time. The system generates output which depicts the status of the entering cohort. The system examines the number of students who were admitted in a specified academic program, those who at the time of the 'snapshot' are still enrolled in the same program, grade point averages of both the original cohort and the remaining (at the time of the Snapshot) cohort of students, the number of students whose culumative grade point average (GPA) has dropped below a critical academic performance level, and the number of academic drops, and the readmits, transfers, and graduates. System and data flow are shown in Figure 2.

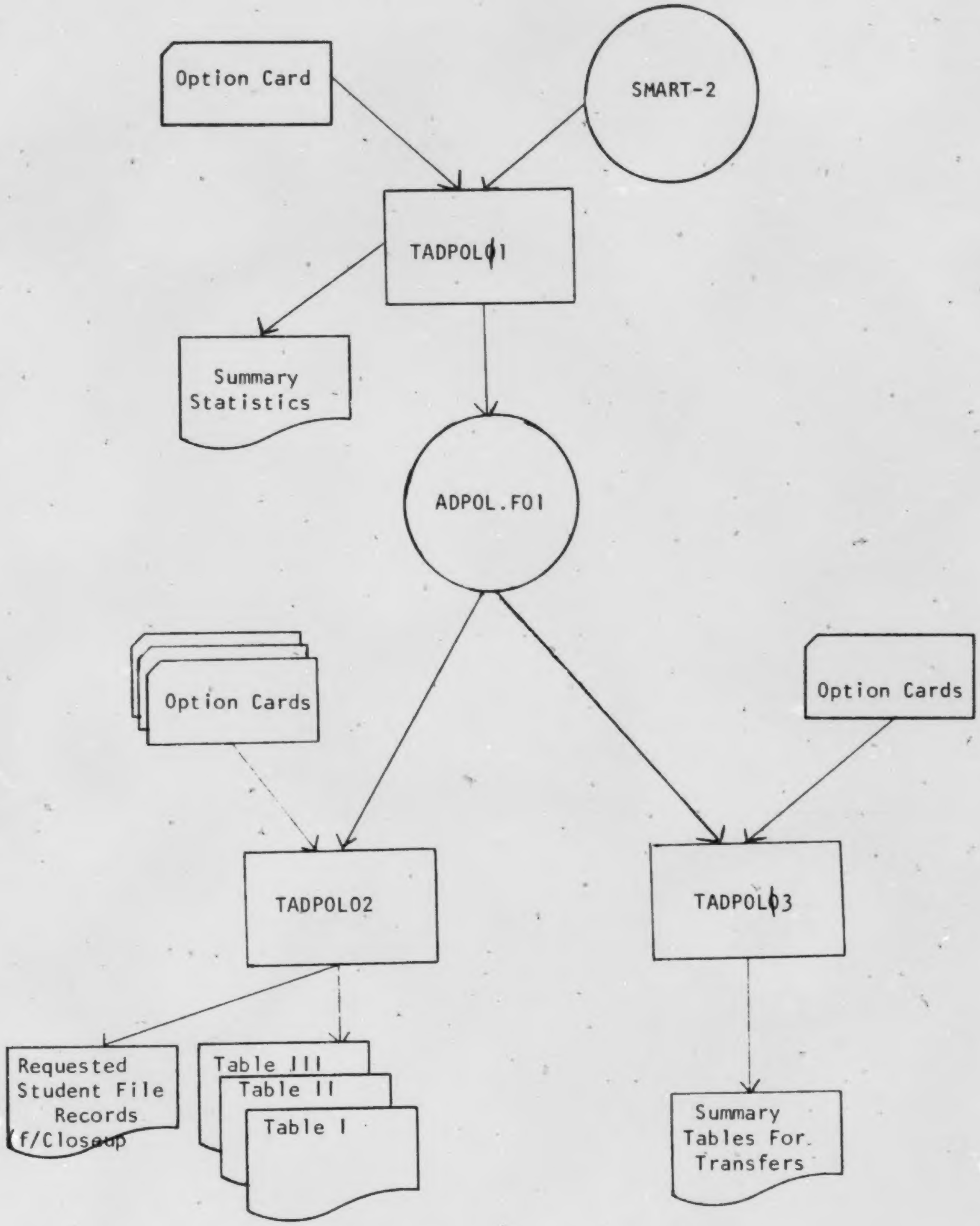
Option Card
SMART-2
TADPOL01
Summary Statistics
ADPOL.F01
Option Cards
Option Cards
TADPOL02
TADPOL03
Requested Student File Records f/Closeup
Table III
Table II
Table I
Summary Tables For Transfers

FIGURE 2 - DATA AND SYSTEM FLOWCHART

The primary evaluation unit for monitoring purposes is the "COHORT." A cohort consists of a group of students who were admitted or transferred to a given campus, and to a specific academic unit (college) and degree level (Baccalaureate or Associate) at a specified year-term. All system output is generated using this definition. For example: a student who entered a Baccalaureate degree program at the Altoona (AA) Campus in the College of Liberal Arts (L) in Fall 1977 will be counted as a "Transfer" if, at the time of the "Snapshot," the student is no longer enrolled in this defined Cohort, i.e., if the student changed Campus or College or Degree-level (Baccalaureate to Associate).

SYSTEM CAPABILITIES

TADPOLES analyzes the academic performance and status of any specified cohort of entering students over a specified (selectable) period of time. The system generates standardized output (tape or hard-copy) which identifies student academic achievement, attrition, and percent of cohort graduating within the specified time period. To re-emphasize the cohort-under-study is defined by college of admission, location of admission, two- or four-year programs, and term and year of entry. All freshman performance and status data are discriminated by admissions category. Specifically, TADPOLES provides: (1) current grade point averages, (2) the number and percent of students who: (a) are below a 2.0 GPA, (b) officially, academically dropped, (c) have failed to re-enroll in the Cohort, (4) have transferred from the cohort-under-study, and (5) have graduated. Table 1 is a partial mock-up of a basic report which describes the performance,

ACADEMIC PERFORMANCE
OF THE
FALL TERM 1976 FRESHMAN COHORT
- UNIVERSITY PARK -

ADMISSION CATEGORY	A #	B #	C GPA	D GPA	E %	F %	G %	H %	I %	J %
1	9	4	3.77	3.73	-	-	-	-	56	-
2	229	162	3.27	3.29	1	-	7	1	23	-
3	196	134	2.93	2.96	4	-	11	1	20	-
4	140	99	2.68	2.66	14	1	9	1	19	-
5	30	17	2.48	2.71	27	3	20	-	20	-
6	29	18	2.13	2.02	41	3	14	-	21	-
7-9	9	7	1.67	1.77	78	-	11	11	11	-
10	4	-	2.05	-	50	-	50	-	50	-
TOTAL	646	441	2.95	2.97	9	-	10	1	22	-

EVALUATION PERIOD: FALL 1976 THROUGH FALL 1977

TABLE 1
(UP "DEMONSTRATION" COLLEGE)

retention, and mobility characteristics of freshmen.

The system also identifies and evaluates transfers into PSU from two- and four-year institutions (Table 2) and separately analyzes campus registrants who transferred from another PSU campus (Table 3). The flexibility to define: (1) the specific cohort to be studied and (2) the interval of time over which the cohort is to be tracked represents a powerful, systematic aid to study and, perhaps, research into the academic consequences of admissions policy.

The system is designed to provide ready access to specific cohort subsets which may exhibit interesting, special characteristics indicating further, in-depth analysis. This feature is a standard option of system which permits cutput of individual student's term-by-term academic profile (with or without privacy protection).

TADPOLES can selectively print tables as requested. The user may choose to have tables printed for all colleges, individually or collectively, or may specify one specific college for study.

Primary System Outputs

At the present time TADPOLES has the capability to produce six different types of output for any selected cohort. These are:

(1) A display of the academic performance of entering freshmen after a specified number of terms. For each admission category (distinguished by the predicted grade point average of the student) this table shows the academic status of the student cohort at the end of the specified time period (number of terms).

ACADEMIC PERFORMANCE OF THE FALL TERM 1976
ADVANCED STANDING COHORT

ADVANCED STANDING COHORT	A #	B #	C GPA	D GPA	E %	F %	G %	H %	I %	J %
From 4-Year Institution to UP*	290	249	2.85	2.89	11	1	11	2	1	1
From 2-Year Institution to UP	173	135	2.55	2.65	25	6	15	1	1	1
From 4-Year Institution to CWC**	172	26	2.78	2.55	19	1	24	1	60	-
From 2-Year Institution to CWC	63	12	2.47	2.34	33	6	25	2	49	-

EVALUATION PERIOD: FALL 1976 THROUGH FALL 1977

TABLE 2

*UP = University Park

**CWC = Commonwealth Campus

ACADEMIC PERFORMANCD OF CWC STUDENTS WHO TRANSFERRED TO UNIVERSITY PARK
FALL TERM 1976

CAMPUS	A*	B**	C′	CC	D′	DD
ALTOONA	(343)	(281)	2.88	2.83	2.92	2.87
ALLENTOWN	(64)	(50)	2.79	2.59	2.82	2.58
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---	---	---	---	---	---	---
WILKES-BARRE	(98)	(74)	2.78	2.66	2.85	2.70
YORK	(131)	(98)	2.79	2.81	2.80	2.82
CWC TOTAL	(3,375)	(2,656)	2.78	2.73	2.80	2.75

EVALUATION PERIOD: FALL 1976 THROUGH SPRING 1978

TABLE 3

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*A = NUMBER OF STUDENTS IN ORIGINAL TRANSFER COHORT; FALL 1976

**B = NUMBER OF STUDENTS REMAINING IN ORIGINAL TRANSFER COHORT; SPRING 1978

C′ = GPA OF COHORT A PRIOR TO TRANSFER
CC = GPA OF COHORT A AFTER TRANSFER

D′ = GPA OF COHORT B PRIOR TO TRANSFER
DD = GPA COHORT B AFTER TRANSFER

(2) A display of the same data categories for those students who transferred in from two- or four-year institutions. Transfer students from other schools are referred as "Advanced Standing" students at Penn State. Grade Point Averages are not predicted for this group.

(3) A display of the same data categories for students who transferred to any campus from any other campus in the Penn State system. There are two versions of the third table which permits examination of grade point averages at the sending campuses, the grade point average at the receiving campus, and the combined grade point average at both the sending and receiving campus.

(4) A term-by-term profile of selected students which provides detail about the academic performance of individual students from any selected cohort subset.

(5) A matrix which describes the nature of program mobility within the institution by category of admission which is a refinement of the statistics available in the "Transfer" column of items (1), (2), and (3) above.

(6) A matrix which describes the nature of program mobility among Colleges without regard to category of admissions which also is a refinement of the "Transfer" statistics found in items (1), (2), and (3) above.

Tables 4 through 8 are samples of five of the six types outputs described above. The sample of item (4) is not included herein due to the specific nature of the data; what is generally of interest in item (4) is the capability to optionally define and then select detailed academic performance data on subsets of each cohort. For example, detailed performance data on top academically-ranked students who transfer from one academic college to another early in their careers has been examined to attempt to determine if certain courses are causing the movement. This type of selectivity has been built into the system and is, perhaps, one of its most significant capabilities.

SUMMARY

This paper has been devoted to an introduction to TADPOLES, a description of its basic capabilities and options, an understanding of the organizational environment within which the system operates and the circumstances which led to the development of the system. For Penn State this system represents a new and heretofore unapproached response to the basic information needs of the policy-making activities of the institution. Many one-shot studies, operational analyses and broad based research projects have been initiated and completed which address in an ad hoc way various policy issues in the institution. This system, however, provides a systematic, computer-based capability to monitor and evaluate institutional policies related to admissions, retention, and mobility. The major advantage of the system is the ability to replicate rapidly the quantitative information necessary for continuous policy monitoring. The existence of a longitudinal student data base, updated on a periodic schedule and the family of programs to analyze the various parameters of cohort success provide the foundation for systematic evaluation of admissions policy.

While the file structure, access methods, and programming languages may differ, the common thread for systematic policy analysis would appear to be a highly integrable, reasonably accurate longitudinal data base. Other areas of policy interest which merit similar consideration for longitudinal data base development are: personnel characteristics, faculty activity (instruction and research) and income and expenditure activity. The history of data base development at Penn State as well as other institutions has been oriented toward creation of better and faster transactional systems. Little, if any, consideration has been given for the information needs of policy-makers and planners. TADPOLES attempts to remedy this situation in one area, Admissions policy.

THE PENNSYLVANIA STATE UNIVERSITY
INSTITUTIONAL RESEARCH DIVISION

THE ADMISSIONS POLICY EVALUATION SYSTEM

C O H O R T   I D :
(1) CAMPUS OF ADMISSION: UNIVERSITY PARK
(2) COLLEGE OF ADMISSION: LIBERAL ARTS
(3) YEAR-TERM OF ADMISSION: FALL '76
(4) DEGREE LEVEL: BACC
(5) YEAR-TERM OF 'SNAPSHOT': SPRG '78

SUMMARY OF COHORT STATUS AT THE END OF SPRG '78

PART I: FRESHMAN ADMISSION

ADMISS. CATEGORY	NO. ENROLLED IN FALL '76	NO. ENROLLED IN SPRG '78	G. P. A. OF GROUP A	G. P. A. OF GROUP B	CUM GPA BELOW 2.0 NO.	CUM GPA BELOW 2.0 %	OFFICIALLY DROPPED NO.	OFFICIALLY DROPPED %	FAILED TO RE-ENROLL NO.	FAILED TO RE-ENROLL %	RE-ENTERED NO.	RE-ENTERED %	TRANSFERRED NO.	TRANSFERRED %	GRADUATED NO.	GRADUATED %	GRADUATED CUM GPA
	A	B	C	D	E		F		G		H		I		J		
1	9	4	3.79	3.76									5	56			
2	232	142	3.29	3.32	3	1			21	9	4	2	69	30			
3	200	119	2.95	2.97	7	4			30	15	1	1	51	26			
4	145	89	2.75	2.79	17	12	4	3	16	11	2	1	36	25			
5	31	13	2.52	2.55	8	26	2	6	5	16			11	35			
6	29	14	2.15	2.15	14	48	3	10	4	14			8	28			
7-9	9	5	1.59	1.79	8	89	1	11	2	22			1	11			
10	4		1.91		3	75			2	50			2	50			
TOTAL	659	386	2.96	3.02	60	9	10	2	80	12	7	1	183	28			

ACADEMIC PERFORMANCE OF ENTERING LIBERAL ARTS FRESHMEN AT UNIVERSITY PARK

TABLE 4

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                                   THE PENNSYLVANIA STATE UNIVERSITY
                                   INSTITUTIONAL RESEARCH DIVISION

                                 THE ADMISSIONS POLICY EVALUATION SYSTEM
C O H O R T   I D :
(1) CAMPUS OF ADMISSION: UNIVERSITY PARK
(2) COLLEGE OF ADMISSION: ANY COLLEGE
(3) YEAR-TERM OF ADMISSION: FALL '76
(4) DEGREE LEVEL: BACC
(5) YEAR-TERM OF 'SNAPSHOT': FALL '77

                             SUMMARY OF COHORT STATUS AT THE END OF FALL '77

PART II: ADVANCED STANDING (NEW STUDENTS)

********************************************************************************************************************************
        |  NO. ENROLLED    |          G. P. A.            |  CUM GPA  | OFFICIALLY| FAILED TO |RE-ENTERED |TRANSFERRED|     GRADUATED
PREVIOUS|  IN        IN    |   OF              OF         | BELOW 2.00|  DROPPED  | RE-ENROLL |           |           |               CUM
INST.   |FALL '76  FALL '77|  GROUP A          GROUP B    | NO.     % | NO.     % | NO.     % | NO.     % | NO.     % | NO.     %     GPA
        |---------------------------------------------------------------------------------------------------------------------
        |   A         B    |    C                 D       |     E     |     F     |     G     |     H     |     I     |        J
********************************************************************************************************************************
        |                  |                              |           |           |           |           |           |
 2-YEAR |  175       137   |   2.55              2.94     |  44    25 |  10     6 |  26    15 |   1     1 |   1     1 |   1     1   2.73
        |                  |                              |           |           |           |           |           |
 4-YEAR |  298       257   |   2.83              2.84     |  31    10 |   4     1 |  32    11 |   7     2 |   2     1 |   3     1   3.13
        |                  |                              |           |           |           |           |           |
 TOTAL  |  473       394   |   2.75              2.91     |  75    16 |  14     3 |  58    12 |   8     2 |   3     1 |   4     1   3.03
********************************************************************************************************************************
```

ACADEMIC PERFORMANCE OF TRANSFER STUDENTS FROM OTHER INSTITUTIONS

TABLE 5

THE PENNSYLVANIA STATE UNIVERSITY
INSTITUTIONAL RESEARCH DIVISION

THE ADMISSIONS POLICY EVALUATION SYSTEM

COHORT ID:
(1) CAMPUS OF TRANSFER: UNIVERSITY PARK
(2) COLLEGE OF TRANSFER: LIBERAL ARTS
(3) YEAR-TERM OF TRANSFER: FALL '77
(4) DEGREE LEVEL: BACC
(5) YEAR-TERM OF 'SNAPSHOT': SPRG '78

SUMMARY OF COHORT STATUS AT THE END OF SPRG '78

PART III: TRANSFERS (WITHIN P S U)

PREVIOUS CAMPUS	NO. ENROLLED IN FALL '77	NO. ENROLLED IN SPRG '78	G. P. A. OF GROUP A PREV	G. P. A. OF GROUP A COMB	G. P. A. OF GROUP B PREV	G. P. A. OF GROUP B COMB	CUM GPA BELOW 2.00 NO.	CUM GPA BELOW 2.00 %	OFFICIALLY DROPPED NO.	OFFICIALLY DROPPED %	FAILED TO RE-ENROLL NO.	FAILED TO RE-ENROLL %	RE-ENTERED NO.	RE-ENTERED %	TRANSFERRED NO.	TRANSFERRED %	GRADUATED NO.	GRADUATED %	GRADUATED CUM GPA
	A	B	C'	C	D'	D	E		F		G		H		I		J		
AA	61	51	2.76	2.72	2.81	2.76	6	10			4	7	1	2	6	10			
AN	8	8	2.76	2.58	2.76	2.58	1	13											
BV	45	39	2.86	2.43	2.88	2.47	2	4			3	7			1	2	3	7	2.68
BK	27	20	2.79	2.76	2.88	2.84	3	11			3	11			3	11	1	4	2.64
BW	41	36	2.97	2.91	3.03	2.97	3	7			5	12							
CL																			
DE	54	45	2.73	2.71	2.78	2.76	9	17			5	9			4	7			
DS	3	3	2.98	2.76	2.98	2.76													
FE	17	14	2.86	2.69	2.81	2.67	1	6							3	18			
HN	24	21	3.03	2.99	2.97	2.85	3	13			2	8			1	4	2	8	3.11
MA	14	12	2.88	2.78	3.03	2.90	2	14							2	14			
MK	35	29	2.64	2.61	2.73	2.69	4	11			4	11			2	6			
NK	13	9	2.79	2.74	3.12	3.07	2	15							4	31			
OZ	53	45	2.78	2.79	2.85	2.85	5	9			3	6			5	9	1	2	3.66
SL	11	9	2.89	2.86	2.97	2.91	1	9	1	9					1	9	1	9	3.01
SN	40	36	2.89	2.78	2.93	2.84	6	15			1	3			3	8	1	3	2.73
SO	18	15	3.06	2.97	3.00	2.92					2	11			1	6			
UP																			
WB	19	17	2.71	2.66	2.66	2.59	3	16			2	11							
YK	16	15	2.87	2.86	2.84	2.83					1	6							
TOTAL	499	424	2.82	2.77	2.87	2.62	51	10	1		35	7	1		36	7	9	2	2.94

N O T E: COLUMNS -C'- AND -D'- REPRESENT THE CUMULATIVE GPA AT THE PREVIOUS LOCATION;
COLUMNS -C- AND -D- REPRESENT THE COMBINED GPA BASED ON WORK DONE BOTH BEFORE A N D AFTER TRANSFER.

ACADEMIC PERFORMANCE OF COMMONWEALTH CAMPUS TRANSFERS TO UNIVERSITY PARK

TABLE 6

THE PENNSYLVANIA STATE UNIVERSITY
INSTITUTIONAL RESEARCH DIVISION
THE ADMISSIONS POLICY EVALUATION SYSTEM

LOCATION: UNIVERSITY PARK
DEGREE LEVEL: BACC
YEAR-TERM OF ADMISSION: FALL '76
YEAR-TERM OF 'SNAPSHOT': FALL '77

COLLEGE OF ADMISSION: ENGINEERING

I. DISTRIBUTION OF STUDENTS TRANSFERRING OUT OF THEIR COLLEGE OF ADMISSION

				RECEIVING COLLEGE (*)															
CAT	ENTERED	TRANS	%	AG	A&A	BUS	ED	(**) ENG	HPE	HDV	LA	EMS	SCI	DUS	INC	NDG	LOC	ASSOC	OTHER
1	35	3	9		1							1	1						
2	223	35	16	1	1	8	3	1		1	2	7	5	6			2		
3	180	40	22			15	1	1		2		5	2	13		1	2		
4	28	5	18	1		2					1	1							
5	19	5	26		1	1								3					
6	10	2	20		1											1			
7-9	10	3	30					1						2			1		
10	14	4	29	1				2								1	3	2	
TOT	525	97	18	3	4	26	4	5		3	3	14	8	24		3	8	2	

(*) THESE COUNTS INCLUDE CHANGES IN COLLEGE AND POSSIBLE CHANGES IN LOCATION AND/OR DEGREE LEVEL.
(**) THIS COLUMN REFLECTS CHANGES IN LOCATION AND/OR DEGREE-LEVEL

PROGRAM MOBILITY BY CATEGORY OF PREDICTED PERFORMANCE

TABLE 7

THE PENNSYLVANIA STATE UNIVERSITY
INSTITUTIONAL RESEARCH DIVISION
THE ADMISSIONS POLICY EVALUATION SYSTEM

LOCATION OF ADMISSION: UNIVERSITY PARK
DEGREE LEVEL: BACC
YEAR-TERM OF ADMISSION: FALL '76
YEAR-TERM OF 'SNAPSHOT': FALL '77

III. COLLEGE TRANSFER MATRIX

* TO * FROM *	RECEIVING COLLEGE (*)												(**)	TOTAL		%
	AG	A&A	BUS	ED	ENG	HPE	HDV	LA	EMS	SCI	DUS	INC	OTHER	OUT	ENTERED	TRANS
AG			3	1	2	1	3	2	1	5	8		6	32	194	16
A&A	1		7	11	2	1	2	7			5		4	40	181	22
BUS				2	2	1	2	5		1	2		4	19	258	7
ED	1		2		3		4							10	125	8
ENG	3	4	25	4			3	3	14	7	24		10	97	525	18
HPE			1	2			2	1			1		1	8	70	11
HDV	1	1	5	7	2	1		7		2	3		1	30	176	17
LA	5	8	43	20	5	3	26		4	7	10		10	141	659	21
EMS			7		2		1	4		2			6	22	121	18
SCI	5	2	36	3	22	3	17	11	8		32		5	144	569	25
DUS	2	3	13	4	4		8	7	2	2			2	47	140	34
INC																
TOT OUT	18	18	142	54	44	10	68	47	29	26	85		49	590	3018	20

(*) THESE COUNTS REFLECT THE FLOW BETWEEN COLLEGES AT THE SAME LOCATION.
(**) THIS COLUMN INCLUDES CHANGES IN LOCATION, DEGREE-LEVEL, AND/OR TRANSFERS TO NON-DEGREE PROGRAMS.

PROGRAM MOBILITY AMONG COLLEGES (WITHIN PSU)

TABLE 8

APPENDIX A

AN OVERVIEW
OF
THE (SMART-2) DATA BASE

APPENDIX A

TADPOLES - THE DATA BASE

The data base which serves TADPOLES is the Student MAster Research Tape (SMART-2). A longitudinal student data base, the SMART was first developed at Penn State in 1969 by the Student Affairs Research (SAR) office (Carl Lindsay, John Musser, and W. Keith Evans). Student Affairs interest focused, at that time, on evaluation of the academic performance, ability, and attrition of freshmen over a four-year period. To do this a longitudinal file was required which would record a single student's academic performance and status (each term) over the duration of the student's career at Penn State. Since 1969 the SMART data base has been used to support the development of student flow models as well as in the student performance research for which it was originally intended. In recent years several enhancements have been introduced. The most significant enhancement (redesign) was completed during Fall Term, 1978, by Dr. Edmond Marks and his colleagues of the Undergraduate Studies Research Support office. These enhancements have resulted in a more complete and accurate data base and has been aptly named "SMART-2."

SMART-2 includes data from an Admissions File, a Student Biographic Data File, a Master (Demographic) Information File on Students, and an Academic Record File (courses, grades, and grade point average). This information is captured each term (for each student) so as to account for each student from admissions until the student leaves the University.

The SMART-2 data system is a collection of computer procedures for: (a) generating a research data base and (b) for retrieving information from this data base. The sub-systems include:

(1) Data Management
(2) Data Collection
(3) Information Retrieval
(4) Degree Audit
(5) Program Essential Courses.

Although the SMART-2 consists of these five functional sub-systems, the real functional units are the individual procedures. Table A-1 identifies the procedure uses.

The SMART-2 file is built from existing central data files as cited in Figure A.1. The Sub-System responsible for the generation and updating of the SMART-2 files ("Full SMART," "Extract," and "Term Summary") constitute the Data Base Management Sub-System. The file is initially created from the current Admissions file and the Master Information for Students (MIFS) file. Each academic term, the current SMART file is updated with the new Admissions file, and the current MIFS file. The SMART file contains a record for any student who has a corresponding record on the MIFS file. In addition to a SMART-2 file, a set of student Archive files are generated; these files have the same structure as the SMART file.

Once each term an additional update of the SMART file can be performed. This procedure processes the SMART file against the student academic record ("transcript") file. The main purpose of this procedure is to move the courses attempted by students to the SMART-2 file. If any of the records have been marked for removal to "System Archive" since the last execution of this procedure than the Archive procedure

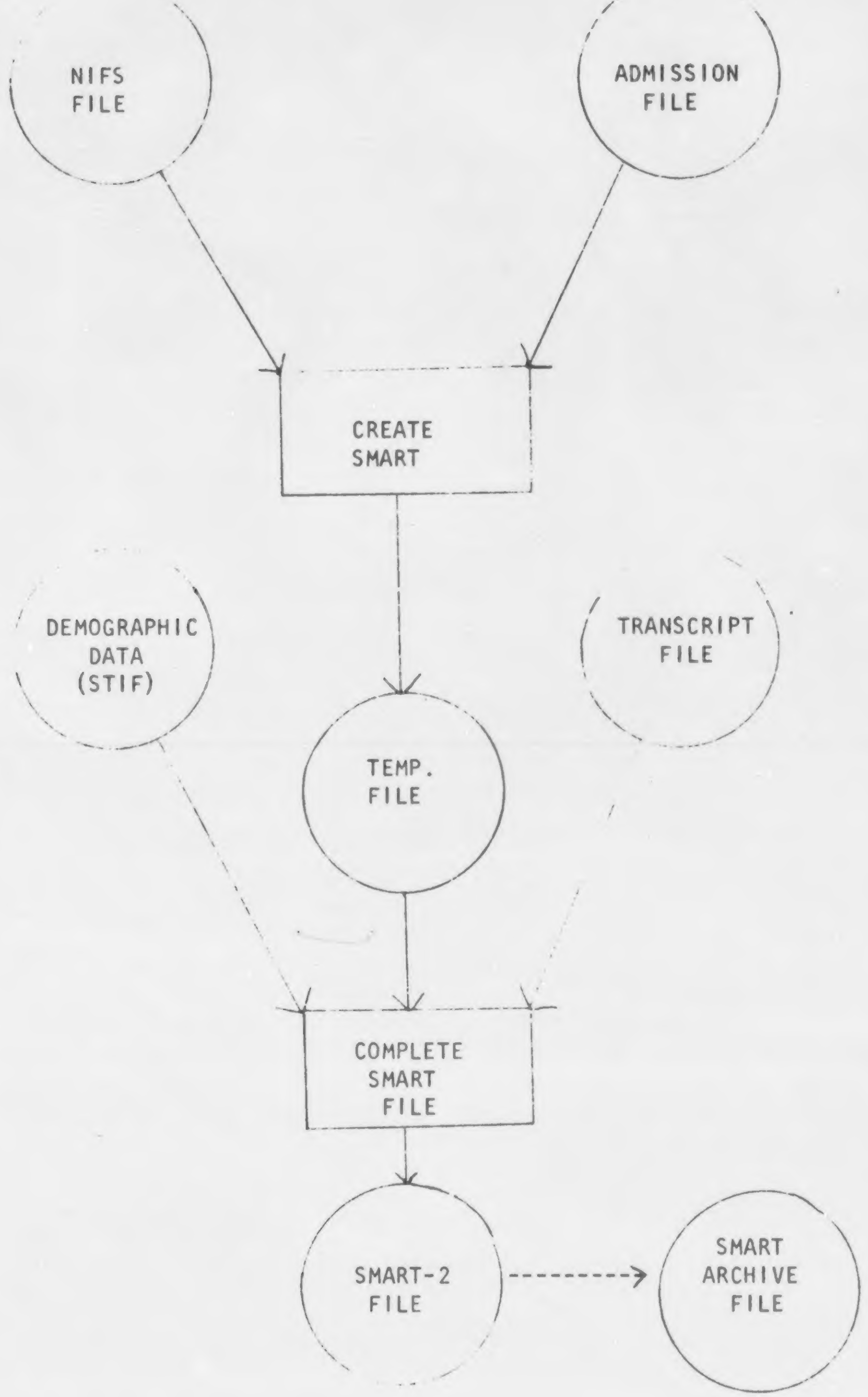
NIFS
FILE
ADMISSION
FILE
CREATE
SMART
DEMOGRAPHIC
DATA
(STIF)
TRANSCRIPT
FILE
TEMP.
FILE
COMPLETE
SMART
FILE
SMART-2
FILE
SMART
ARCHIVE
FILE

FIGURE A.1 - SMART-2 DATA BASE CREATION

The Main Updating Procedure of the System uses the MIFS and ADM Files to produce a new SMART File every term. Marks records for Archiving.

Updates the SMART File with Student courses from the Transcript File; also produces the Archive Files for all students so identified.

Updates SMART File with Student Information For (STIF) File.

The Social Security Change Procedure.

Archive Procedure - Removes records marked for archiving from the current SMART file to the archived files.

Extract - Builds an Extract, an Edited Full SMART, and Term Summary Files for use in the Data Collection and Information Retrieval Sub-Systems. During editing it will update high school codes and enter local addresses.

Editor - Processes and verifies User Data cards before passing them to the User-Update Procedure.

User-Update - Updates the SMART File from the User Data cards.

Retrieve - Produces specialized Reports, Extract Files, Punched Card Files, for any selected group of Students.

Audit - Produces transcripts, degree audits, and letters for any selected group of Students.

SAS - A commercially available Statistical Analysis and Report Generation Package.

TABLE A-1. The SMART-2 System Procedures can be run to move those records to the Archive files.

Inasmuch as the SMART-2 system requires several centralized, University-owned data files, and due to data security concerns, the system is run in a closed DP shop. A copy of the current SMART-2 file and the Archive files are then stored in an open computer shop with all files password protected to ensure privacy.

The SMART-2 data base is not described further in this paper; however, additional materials describing the data base are available from Dr. Edmund Marks, Director, Office of Undergraduate Studies Research Service at The Pennsylvania State University, University Park, Pa. 16802.

The data base (SMART-2), then, is the only Penn State student data resource which permits systematic, longitudinal analysis of student performance. We view the system and the data base as a University resource equally accessible by internal University users who require the data for the conduct of official University business.

APPENDIX B

DETAILED DESCRIPTION
OF
THE BASIC OUTPUT FORMATS

DETAILED EXPLANATION OF THE COHORT IDENTIFICATION (ID)

The system defines the cohort of students in a very specific manner. There are five basic characteristics which define each cohort. These are:

(1) Campus of Admission - Specific Commonwealth Campus OR all Commonwealth Campuses combined OR all campuses combined (ALL-U).

(2) College of Admission - Any college within a campus, or within CWC, or within All-U, OR all colleges combined within (1).

(3) Year/Term Admission of Transfer - The year/term in which the group first attended campus (1) and college (2).

(4) Degree Level - Associate or Baccalaureate Degree Program, into which the group was admitted in year/term (3) at campus (1), college (2).

(5) Year/Term of "Snapshot" - Any year/term subsequent to (3). The status of the cohort is examined at the end of this year/term.

Any movement of a student from one cohort to another during the elapsed time between admission to the cohort and the "snapshot" will be recorded in the "Transfer" column (1) of the standard report format.

DESCRIPTION OF THE STANDARD REPORTING FORMATS

There are three basic reporting formats which have been developed to date. The first format is used to display output described for items (1), (2), and (3) on pages 7 and 8 and provides information on the academic performance, retention, and mobility of a specific cohort. The second format relates to item (4) on page 8 and provides detailed information on an individual student to the level of each academic course. The third is a statistical table which provides data on the inter-college transfer phenomenon and is described in items (5) and (6) on page 8.

"Cohort" Performance Analysis Report

This report contains ten columns of data about the academic performance, retention, and mobility of a specific cohort. The report as shown by example in Table 1 summarizes the characteristics of the "Cohort":

COLUMN	DESCRIPTION OF DATA
(A)	The number of students who actually enrolled at time (3), campus (1), college (2), and degree level (4).
(B)	The number of students from group (A) who, at time (5), are still enrolled at the same campus, college, and degree level as those to which they were originally admitted. NOTE: If the 'Cohort ID' refers to students admitted to a certain college at a certain campus, group (B) consists of those students who, at time (5), are still at the same campus and college. If the 'Cohort ID' identifies

COLUMN	DESCRIPTION OF DATA
(B)	students who were admitted to a certain campus in any college, then group (B) consists of the students who are still enrolled at that campus, even if some of them have changed colleges within that campus. If the 'Cohort ID' identifies students who were admitted to a certain college at any PSU campus (All-U), then group (B) consists of those students who, at time (5), are still enrolled at the same college, at any location, even if some have changed campuses.
(C)	The GPA of group (A) over the entire period from time (3) to time (5). NOTE: In Table III (Transfers), there is an additional column--(C)--which shows the GPA of the transferring students at their previous location.
(D)	The GPA of Group (B) over the entire period from time (3) to time (5).
	College. (In the latter case he will be counted as a transfer.) On the other hand, if we are looking at the cohort consisting of students who were admitted at some campus to any college, then the same students, both the one returning to his original college and the one returning to a different college, will be counted as readmits.
(E)	The number and percentage of students from group (A) whose cumulative GPA at time (5) (or in the last term they were in attendance) dropped below 2.0.
(F)	The number of students from group (A) who officially dropped or withdrew from the University between time (3) and time (5) and are still not enrolled at time (5).
(G)	The number and percentage of students from group (A) who dropped out for other reasons, i.e., students who are not enrolled at PSU at time (5).
(H)	The number and percentage of students from group (A) who were readmitted to the same program (campus, college, degree level) as the one to which they had been admitted/transferred at time (3) after having dropped out or transferred during the period under consideration. NOTE: As in the case of counting students in group (B), 'readmits' are defined in terms of the original 'cohort.' When the cohort consists

COLUMN	DESCRIPTION OF DATA
(H)	of students who were originally admitted to a certain campus and college, then a student will be counted as readmitted if he returns to the same college at the same campus, but not if he returns to the same location but to another college. (In the latter case he will be counted as a transfer.) On the other hand, if we are looking at the cohort consisting of students who were admitted at some campus to any college, then the same students, both the one returning to his original college and the one returning to a different college, will be counted as readmits.
(I)	The number and percentage of students from group (A) who have transferred from the campus and/or college and/or degree level to which they had originally been admitted or transferred. NOTE: As in the case of counting students in group (B) and readmits, the definition of 'transfers' depends on the Cohort ID.
(J)	The number and percentage of students from group (A) who have graduated between time (3) and time (5). In addition to the counts, the cumulative GPA of these students at the time of graduation is shown.

The first format is used as the basis for reporting the academic performance, retention, and mobility of three categories of "entering" students: (1) Freshmen, (2) Advanced Standing (from other institutions) and (3) Transfer students who transfer from one campus to another at a given point in time. In each of the three tables a different type of discrimination is provided:

(a) Table I displays the student performance data for each of ten academic freshman admission categories. These categories are based on the predicted grade point averages:

CATEGORY OF ADMISSIONS	RANGE OF PREDICTED GRADE POINT AVERAGE
1	3.50 - 4.00
2	3.00 - 3.49
3	2.75 - 2.99
4	2.50 - 2.74
5	2.25 - 2.49
6	2.00 - 2.24
7	1.90 - 1.99
8	1.70 - 1.89
9	1.40 - 1.69
10	0.00 - 1.39

TABLE B.1 - ADMISSIONS CATEGORY DEFINTIONS

(b) Table II provides summarized data on the academic performance of advanced standing students subdivided into two groups:

(1) Those who came from 2-year institutions.

(2) Those who came from 4-year institutions.

(c) Table III depicts the academic performance of students who transfer within the PSU system. This table displays data according to the campus the "entering" students had attended prior to transfer.

The campus codes and corresponding names used in Table III are shown in Table 2 below.

AA - Altoona
AN - Allentown
*BD - Behrend
BK - Berks
BR - Beaver
**CL - Capitol
DE - Delaware
DS - DuBois
FE - Fayette
MA - Mont Alto
MK - McKeesport
NK - New Kensington
OZ - Ogontz
SL - Schuylkill
SN - Worthington Scranton
SO - Shenango Valley
***UP - University Park
WB - Wilkes-Barre
YK - York

TABLE B.2 - CAMPUS CODES

*Four Year Campus/College
**Upper Division Campus/College
***Main Campus

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AN ACADEMIC INCOME-COST MODEL FOR INSTITUTIONAL PLANNING

Edward D. Jordan
The Catholic University of America
Washington, DC

The Academic Unit Income-Cost Model is designed to provide a continuous method of analyzing income and costs associated with the various academic units as related to each other and to the institution as a whole. With the stated assumptions the model can be used as a management planning tool within the academic community by revealing past trends and possible future expectations. The basic input data are derived from standard statistical files and the standard auditor's report. A solvency ratio is derived by taking the ratio of total associated income to total associated costs. The total income allocated to the various schools and departments consists of tuition, service credit, fees, sales and services, recovery of indirect costs and non-scholarship endowments (endowed chairs). Total direct cost consists of appropriately prorated shares of instruction, library, student aid, academic space charges, public service and academic computer charges. Indirect cost categories are student services, institutional support, non-academic plant and mandatory transfers. Solvency ratios over a time frame of several years are plotted by computer graphic techniques to develop longitudinal trends.

AN ACADEMIC INCOME-COST MODEL FOR INSTITUTIONAL PLANNING

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An Academic Unit Income-Cost Model is designed to provide a continuous method of analyzing income and costs associated with the various academic units as related to each other and to the institution as a whole. With the assumptions stated below the model can be used as a management planning tool within the academic community by revealing past trends and possible future expectations. The basic input data are derived from the standard statistical files and the standard auditor's report.

A solvency ratio is derived by taking the ratio of total associated income to total associated costs. Different sets of solvency ratios for each academic unit are developed corresponding to different service credit assumptions for tuition income. Service credit is a term used to describe the redistribution of tuition income to compensate the academic units that provide teaching services to non-major students. An underlying assumption of the Income-Cost Model is that a percentage of tuition income is allocated to the academic unit which claims the student as a major. The remaining percentage of the student's tuition is distributed among those units teaching the major student using the induced course load matrix.

Academic Related Income

Total academic related income allocated to the various academic units is shown in Table I. The income is comprised of Tuition, Service Credit (3 cases), Fees, Sales and Services, Recovery of Indirect Costs and Non-Scholarship Endowment (endowed chairs). On the university level, Tuition and Fees account for 95% of academic related total income, followed by Recovery of Indirect Costs, 3%; and the remaining categories, about 2% of

TABLE I

TOTAL INCOME ($) BY ACADEMIC UNIT (YEAR)

ACADEMIC UNIT	(1) TUITION	(2) SERVICE CREDIT (CASE 1)	(3) SERVICE CREDIT (CASE 2)	(4) SERVICE CREDIT (CASE 3)	(5) FEES	(6) SALES AND SERVICE	(7) RECOVERY OF INDIR COSTS	(8) NON SCHOL ENDOWM	(9) TOTAL INCOME (CASE 1)	(10) TOTAL INCOME (CASE 2)	(11) TOTAL INCOME (CASE 3)
A	6272787	353344	471107	588925	122984	154786	304097	39488	7247486	7365249	7483067
B	825951	12160	16213	20267	21025	4354	3436	0	866926	870978	875033
C	2734489	(544128)	(725476)	(906908)	39347	0	265954	0	2495662	2314314	2132882
D	2219955	(13568)	(18090)	(22614)	85360	0	13060	4142	2308949	2304427	2299903
E	1127408	(90112)	(120145)	(150191)	137157	10198	10203	0	1194855	1164822	1134775
F	1240700	(43136)	(57512)	(71896)	23363	0	67166	875	1288967	1274591	1260207
G	2116015	(371520)	(495341)	(619219)	30239	0	68030	0	1842764	1718944	1595065
H	243019	376640	502167	627753	3632	0	1693	5769	630752	756280	881865
I	1346897	320320	427077	533883	17872	0	0	134968	1820057	1926813	2033620
UNASSIGNED	277335	0	0	0	0	0	0	0	277335	277335	277335
UNIVERSITY	18404556	0	0	0	480978	169338	733639	185242	19973753	19973753	19973753

total income. Note that the Service Credit formulas do not affect university totals, but redistribute tuition income among individual academic units.

Table II outlines the Service Credit calculations. Student credit hours (SCH) taught (column 1) by academic units and SCH taken by student majors are obtained from student statistical files and course enrollment files. The SCH taught is subdivided into SCH taught to majors (column 3) and SCH taught to non-majors (column 4) for the various academic units. SCH taken by majors is listed in column 5. Column 7 represents the net SCH taught by a school or department less the SCH taken by its majors. A positive entry in this column denotes that the academic unit teaches more credit hours to non-majors (service students) than its own majors receive from other academic units. A negative entry indicates that the academic majors receive more credit hours from other academic units than the unit teaches to non-majors.

Service credit rates are computed by dividing the full-time undergraduate tuition rate by 30 (credits), and then multiplying by the percentage to be allocated to the service school or department.

Case 1: \$3200/30 x 60% = \$ 64.00 (60% to service dept; 40% to home dept)
Case 2: \$3200/30 x 80% = \$ 85.33 (80% to service dept; 20% to home dept)
Case 3: \$3200/30 x 100% = \$106.67 (100% to service dept; 0% to home dept)

The Case 1 (60%/40%) distribution has been in effect since the initial presentation of the Income-Cost Model for 1971-72. The Case 2 (80%/20%) distribution has been added to enable comparability with some other selected universities, which operate under the 80%/20% model. State universities often are budgeted by the Case 3 (100%/0%) distribution of tuition income.

TABLE II

SERVICE CREDIT BY ACADEMIC UNIT (YEAR)

ACADEMIC UNIT	(1) SCH TAU ACAD YR	(2) ADJ SCH TAU ACAD YR	(3) SCH TAU MAJORS ACAD YR	(4) SCH TAU NON-MAJ ACAD YR	(5) SCH TAK ACAD YR	(6) ADJ SCH TAK ACAD YR	(7) SCH TAU LESS SCH TAK	(8) SERVICE CREDIT (CASE 1)	(9) SERVICE CREDIT (CASE 2)	(10) SERVICE CREDIT (CASE 3)
A	52807	52807	39794	13013	47286	47286	5521	353344	471107	588925
B	4883	4883	3851	1032	4693	4693	190	12160	16213	20267
C	15699	15699	15118	581	24201	24201	(8502)	(544128)	(725476)	(906908)
D	17501	17501	17420	81	17713	17713	(212)	(13568)	(18090)	(22614)
E	8787	8787	8109	678	10195	10195	(1408)	(90112)	(120145)	(150191)
F	9664	9664	9457	207	10338	10338	(674)	(43136)	(57512)	(71896)
G	10993	10993	10896	97	16798	16798	(5805)	(371520)	(495341)	(619219)
H	7509	7509	1407	6102	1624	1624	5885	376640	502167	627753
I	14232	14232	8199	6033	9227	9227	5005	320320	427077	533883
UNIVERSITY	142075	142075	0	0	142075	142075	0	0	0	0

Academic Unit Costs

The total cost of each academic unit is developed. Total Direct Cost consists of Instruction, Library, Student Aid, Academic Space Charges, Public Service and Academic Computer Charges. "Modified" direct cost excludes academic space charges, student aid and continuing education and workshop expenditure from the direct cost total. It is upon this modified direct cost base that associated Indirect Costs are distributed. Indirect cost categories are Student Services, Institutional Support, Non-Academic Plant and Mandatory Transfers. These categories combined give an indirect cost rate of 39% when applied to modified direct costs.

An example of the percentage distributions of some of the major expenditure items as related to direct and total costs would be:

	Amount	Percentage of Direct Cost	Percentage of Total Cost
Instruction	$12,731,997	66.1%	51.1%
Library	1,557,383	8.1	6.2
Student Aid	2,704,060	14.0	10.9
Academic Space	1,659,239	8.6	6.7
Other	625,187	3.2	2.5
Total Direct Cost	$19,277,866	100.0%	77.4%
Student Services	1,343,962		5.4
Institutional Support	2,688,843		10.8
Plant (Non-Academic)	1,108,115		4.4
Mandatory Transfers	494,349		2.0
Total Indirect Cost	$ 5,635,269		22.6%
Total Cost	$24,913,135		100.0%

Solvency Ratios

The academic unit solvency ratio is derived by dividing total academic associated income by total associated costs. Table III presents three sets of solvency ratios for each school, corresponding to the three service credit assumptions on tuition income. The results of the different

TABLE III

SOLVENCY BY ACADEMIC UNIT (YEAR)

ACADEMIC UNIT	(1) INCOME (CASE 1)	(2) INCOME (CASE 2)	(3) INCOME (CASE 3)	(4) COST	(5) SOLVENCY (CASE 1)	(6) SOLVENCY (CASE 2)	(7) SOLVENCY (CASE 3)
A	7247486	7365249	7483067	10266521	70.59	71.74	72.89
B	866926	870978	875033	1211969	71.53	71.86	72.20
C	2495662	2314314	2132882	3367778	74.10	68.72	63.33
D	2308949	2304427	2299903	2250232	102.61	102.41	102.21
E	1194855	1164822	1134775	1689792	70.71	68.93	67.15
F	1288967	1274591	1260207	1204503	107.01	105.82	104.62
G	1842764	1718944	1595065	1629654	113.08	105.48	97.88
H	630752	756280	881865	873109	72.24	86.62	101.00
I	1820057	1926813	2033620	2170411	83.86	88.78	93.70
UNASSIGNED	277335	277335	277335	249166	111.31	111.31	111.31
UNIVERSITY	19973753	19973753	19973753	24913135	80.17	80.17	80.17

service credit assumptions are kept separate, leading to three cases of income and also three different solvency ratios. It should be noted that these service credit assumptions change the distribution of total university tuition income among the various academic units; however, the total university tuition income remains unchanged under these assumptions and hence university-wide solvency ratios remain constant for the three cases.

The university-wide solvency ratio of 80.17% indicates that the income associated with the academic units accounts for 80.17% of the total operating costs of the university (excluding separately funded operations such as auxiliary enterprises, sponsored research, etc.). In order to achieve a balanced financial condition, the remaining 19.83% of income is obtained from outside sources such as private gifts. For the individual schools or departments, a solvency ratio above 100% indicates that the total associated income exceeds the total associated cost and contributes to the university as a whole.

Subsidies

The subsidy of an academic unit represents the difference, in dollars, between income and costs. Table IV presents the direct cost subsidy (columns 2, 3 and 4) defined as total income less direct cost, and the total cost subsidy (columns 6, 7 and 8) defined as total income less total cost. The three different income assumptions can result in three subsidy levels for each academic unit. A positive direct cost subsidy indicates recovery of all direct costs and a contribution toward associated indirect costs. A negative direct cost subsidy indicates a partial recovery of direct costs.

TABLE IV

SUBSIDY ($) BY ACADEMIC UNIT (YEAR)

ACAD UNIT	(1) DIRECT COST	(2) DIRECT COST SUBSIDY (1)	(3) DIRECT COST SUBSIDY (2)	(4) DIRECT COST SUBSIDY (3)	(5) TOTAL COST	(6) TOTAL COST SUBSIDY (1)	(7) TOTAL COST SUBSIDY (2)	(8) TOTAL COST SUBSIDY (3)
A	7996959	(749473)	(631710)	(513892)	10266521	(3019035)	(2901272)	(2783454)
B	931837	(64911)	(60859)	(56804)	1211969	(345043)	(340991)	(336936)
C	2650798	(155136)	(336484)	(517916)	3367778	(872116)	(1053464)	(1234896)
D	1696022	612927	608405	603881	2250232	58717	54195	49671
E	1303149	(108294)	(138327)	(168374)	1689792	(494937)	(524970)	(555017)
F	900551	388416	374040	359656	1204503	84464	70088	55704
G	1243213	599551	475731	351852	1629654	213110	89290	(34589)
H	643183	(12431)	113097	238682	873109	(242357)	(116829)	8756
I	1662988	157069	263825	370632	2170411	(350354)	(243598)	(136791)
UNASSIGNED	249166	28169	28169	28169	249166	28169	28169	28169
UNIVERSITY	19277866	695887	695887	695887	24913135	(4939382)	(4939382)	(4939382)

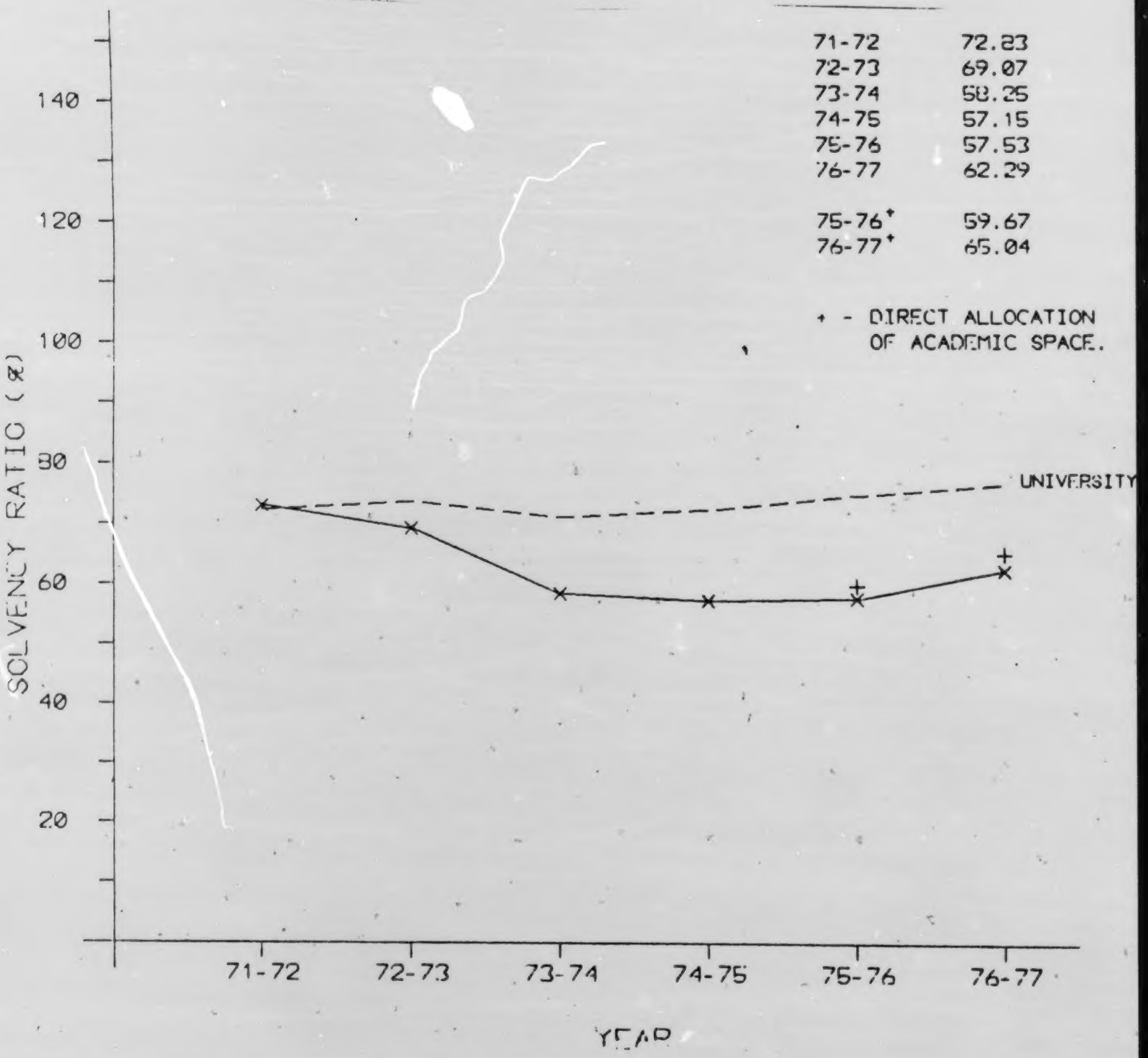
It should be noted that "direct cost" is defined to include instruction expenditures, prorated distributions of library costs, student aid, academic space charges, public service expenditures (where appropriate) and academic computer costs.

For the university, total academic related income exceeds direct costs; hence a positive direct cost subsidy is indicated for the university as a whole. Among the schools the direct cost subsidy ranged from a high of $749,473 to a contribution of $612,927 by one school. Individual academic units with solvency ratios of less than 100%, but a positive direct cost subsidy, have met all direct costs and have made a partial contribution toward associated indirect costs. A negative direct cost subsidy shows only partial recovery of direct costs.

A positive total cost subsidy (columns 6, 7 and 8) indicates that the academic unit has met all direct and associated indirect costs, and from a university viewpoint is helping to reduce dependency on outside revenue. This is equivalent to a solvency ratio of 100% or greater.

Solvency ratios over a time frame of several years can be plotted by computer graphics techniques to develop longitudinal trends as shown in Figure 1 for the university and one of the academic units.

FIGURE 1
LONGITUDINAL SOLVENCY RATIO
(1971-72 TO 1976-77)



THE DESIGN AND IMPLEMENTATION OF AN ON-LINE FINANCIAL SYSTEM

Hartford Tunnell
Southwest Texas State University
San Marcos, Texas

ABSTRACT

In the summer of 1975, Southwest Texas State University began the development of an on-line financial system. The heart of the system would consist of a fund accounting system with subsystems to support Auxiliary Services, Budgeting and Grants, Financial Aids, Payroll, Personnel, Purchasing and Registration.

These systems are now in operation. Over twenty colleges and universities have visited our campus to view these systems. Several of these colleges have acquired or expressed an interest in acquiring the software to this system. We are currently installing our financial systems at Texas Women's University.

This paper contains the story of how Administrative Data Processing and the user community joined forces in 1975 to develop these systems.

THE DEVELOPMENT OF AN ON-LINE FINANCIAL SYSTEM

In the summer of 1975, Southwest Texas State University received the delivery of a new timesharing computer system. The university then undertook a revolutionary change in its approach to data processing. The data processing environment had been a card and tape oriented system with the Data Processing Department responsible for keypunching the user's data. The approach in the future would be on-line data processing with the user departments assuming the responsibility for data entry.

Now, most of our data processing applications are done on-line. Our computer site and user departments have been visited by over twenty universities and state agencies. Recently, the Accounting Office and Administrative Data Processing undertook the joint venture of implementing our Fund Accounting System at Texas Women's University. The system was to be in operation in the fall of '79.

One of our first major projects was the development of a complete on-line registration process. In the past, registration had been carried out using card packets. The main function of the old system was the processing of student records (rosters, etc.). The old system performed none of the financial tasks of registration. A student's fees were hand-calculated and all financial recordkeeping was done manually.

The new registration system was to be designed to handle all of the financial calculations at registration, including tuition adjustments. We began working with the Accounting Office and the Registrar on the design of this system in the fall of '75 and we went on-line during the spring registration of '76.

Two fulltime programmers and a student programmer were assigned the task of developing the system. With the assistance of the user personnel, the system was just completed the night before the first day of registration. The new system had not undergone a thorough testing, therefore, there were a number of nervous people in the crowd during the first day of registration.

As the registration processing began, it became apparent that there was a "bug" in the system that was slowing down the process. The student lines began to back up. The students were trickling through the lines picking up their automated receipts, but at too slow a rate. There was serious talk about abandoning the new process and reverting back to the old registration process. However, in an hour, the problem with the system was solved and the system began to function smoothly.

Many students and university personnel commented after the three days of registration were over that it was the smoothest registration they had ever seen. The Accounting Office had balanced their financial reports within an hour or two after the last student was processed each day.

There are many problems that must be overcome in the development of any automated application. There are no "magic" buttons on computers. Regardless of what television commercials imply - computers do not read minds. Computer systems are developed by data processing professionals working with specialists in the application that is to be automated.

We have continued to enhance the Registration System since it was installed. In the summer of '76, we did our first automated add/drop processing, and in the fall registration of '76, we gave financial aid credit on-line at registration time. Today we are considering preregistration.

COMPUTING SERVICES: ORGANIZATION CHART

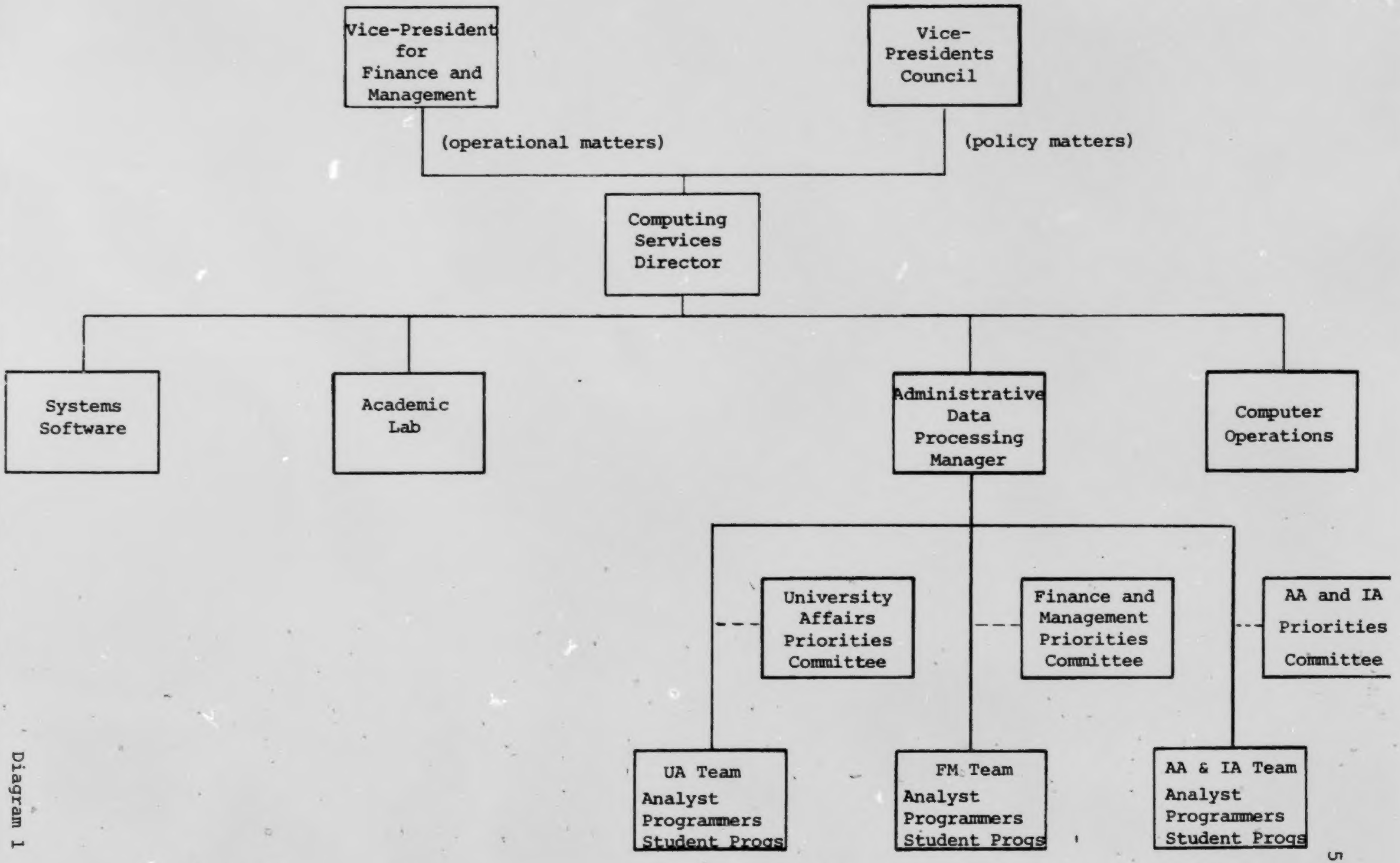

Vice-President for Finance and Management
Vice-Presidents Council
(operational matters)
(policy matters)
Computing Services Director
Systems Software
Academic Lab
Administrative Data Processing Manager
Computer Operations
University Affairs Priorities Committee
Finance and Management Priorities Committee
AA and IA Priorities Committee
UA Team
Analyst
Programmers
Student Progs
FM Team
Analyst
Programmers
Student Progs
AA & IA Team
Analyst
Programmers
Student Progs

Diagram 1

The Organization of Computer Services

The Computer Services Department at SWTSU reports to the Vice-President of Finance and Management. The department is divided into three major groups: Operations, the Computer Lab, and Administrative Data Processing. Operations is responsible for scheduling the computer runs each night and dispersing the computer reports to the users. The Computer Lab oversees the use of the computer by the academic community. Administrative Data Processing is responsible for the design and implementation of the university's administrative systems.

Administrative Data Processing (ADP) is made up of three teams with each team consisting of a systems analyst and several programmers. We have had a great deal of success using student programmers. During the systems development stage, ADP consisted of the following teams:

1) University Affairs Systems Team - This group provides systems design and programming support for the following areas:
   a) Registrar
   b) Admissions
   c) Financial Aids
   d) Residential Living
   e) Library
   f) University Police
   g) Placement and Counseling
   h) Athletics
2) Finance and Management Systems Team - This group provides systems design and programming support for the following areas:
   a) Accounting

  - b) Payroll
  - c) Auxiliary Services
  - d) Physical Plant
  - e) Budgeting and Grants
  - f) Planning and Analysis
  - g) Purchasing
  - h) Property Management

3) Academic Affairs/Institutional Advancement Systems Team - This team provides the systems design and programming support for the following areas:
   - a) Alumni
   - b) Development
   - c) Public Service and Continuing Education

The Role of the User in System Development

The great mathematician/physicist, Sir Isaac Newton, once said, "If it appears that I have seen farther than the average man, it is because I stood on the shoulders of giants.". Newton recognized the contributions of others which led to his success in the sciences. It is also imperative that those of us in data processing not overlook the contributions that are made by the user community.

At SWTSU, the user community played a major role in the design and implementation of each of the university's major systems. We have attempted to develop a close working relationship with the user departments, and system development has also been a team effort with ADP and the users on the same team. If projects are not coordinated between data processing and the user groups, the result will be inferior systems with the users blaming data processing for system oversights and data processing personnel blaming the users. Most oversights can be eliminated if users and data processing personnel are working together.

Most university financial applications require frequent modifications. These changes can be a result of requests within the university, new laws, requests by the Board of Regents, or Coordinating Board changes. It is impossible for a programmer to keep up with all the details of a major system, especially if the programmer is responsible for two or three major systems. It is imperative that data processing personnel and the user community maintain strong lines of communication if application software is to be properly developed and maintained.

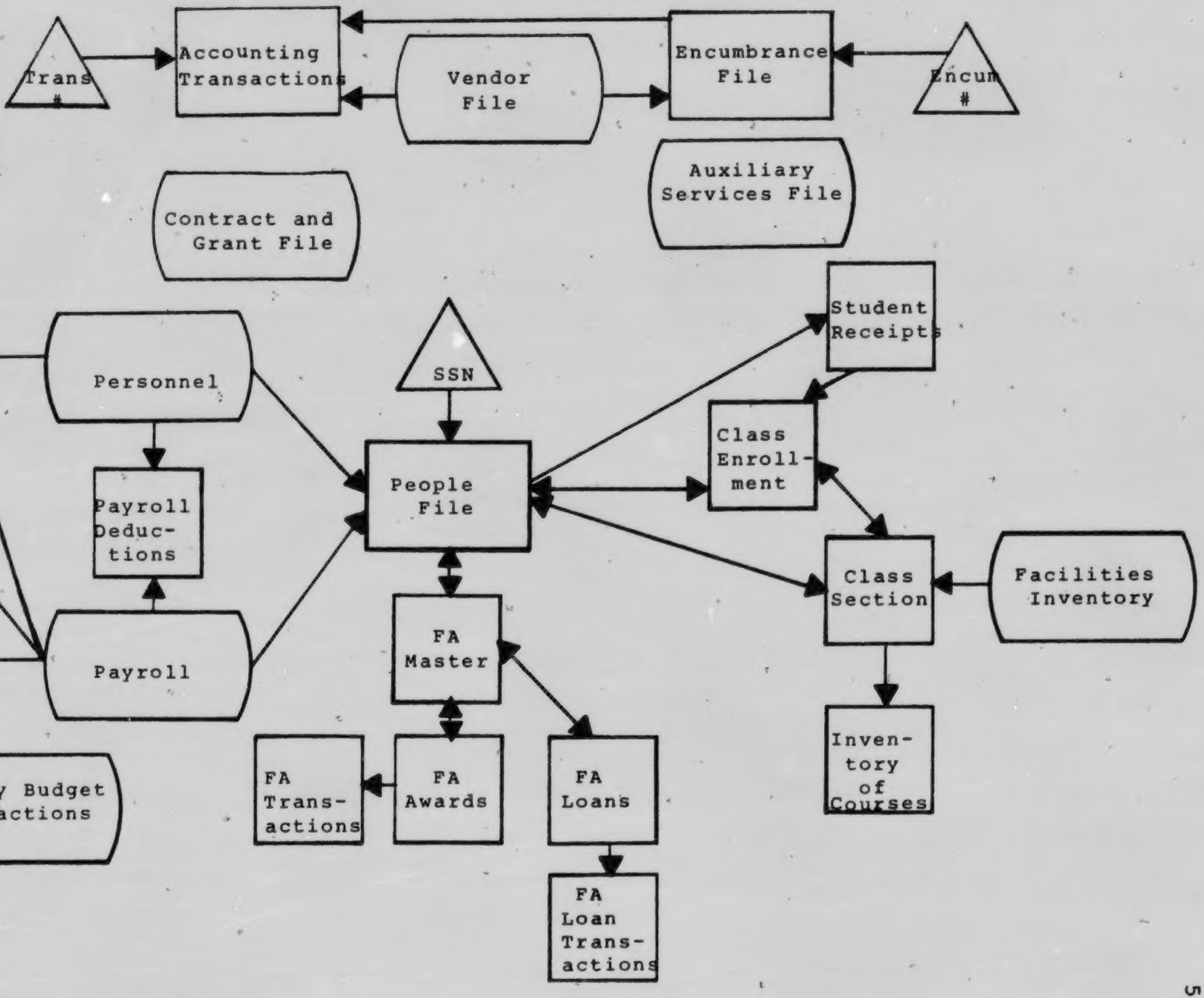
At SWTSU, we began systems development by holding general meetings with the users, whereby we discussed the general requirements of each system. It was apparent that these meetings alone would not lead to adequately defined systems. There were too many details to keep up with and too many unclear concepts. Communication was poor because each group was speaking its own language. Financial personnel were using terminology that was specific to their own jobs and data processing personnel were doing the same.

The programming staff then began informal meetings with the university personnel who were specialists in the given application. It was in these meetings that the heart of the financial system was defined and the lines of communication were established between the programmer and financial user. The development of a financial system requires programmers with a talent for financial programming, experienced financial users, and a spirit of cooperation between these groups. Without this, the development of a technical system is virtually impossible.

Data Base Design

The design of SWTSU's data base is patterned after a data base that was originally designed at Pan American University. The data base is an integrated, linked data base consisting of ISAM and RANDOM (relative) files. The major files in the data base and their interrelationships are given in Diagram 2. The symbol △ represents an ISAM file that is primarily used as an index to a record in a RANDOM file. The arrow symbol (→) represents a pointer from one file to another. The RANDOM files are represented by the symbol ▭, with the stacked rectangles representing internal chaining. We have no data base management system, therefore, all file management is done by the programs. The symbol ▢ represents an ISAM file that is a data file and not just an index to a RANDOM file. The stacked rectangles symbolize chaining or linking with the particular file. For example, all the receipts for a student are stored in a single file and these are chained together. This gives the user the capability of displaying all the receipts a student has paid during a semester on a CRT. Internal chaining is not shown on Diagram 2, however, chaining is shown on the more detailed diagrams which follow.

Diagram 2


Trans #
Accounting Transactions
Vendor File
Encumbrance File
Encum #
Auxiliary Services File
Contract and Grant File
Student Receipts
Salary Appointments
Personnel
SSN
Class Enrollment
People File
Payroll Transactions
Payroll Deductions
Class Section
Facilities Inventory
FA Master
Wage Appointments
Payroll
FA Transactions
FA Awards
FA Loans
Inventory of Courses
Salary Budget Transactions
FA Loan Transactions

SOUTHWEST TEXAS STATE UNIVERSITY

ADMINISTRATIVE DATA BASE

Registration Data Base

The primary files used in the registration process are shown in Diagram 3. These files include the People File, Class Enrollment File, Receipt File, Class Section File, Inventory of Courses File, Trust Funds File, Financial Aids File, Tuition Adjustment File, and the Miscellaneous Codes File.

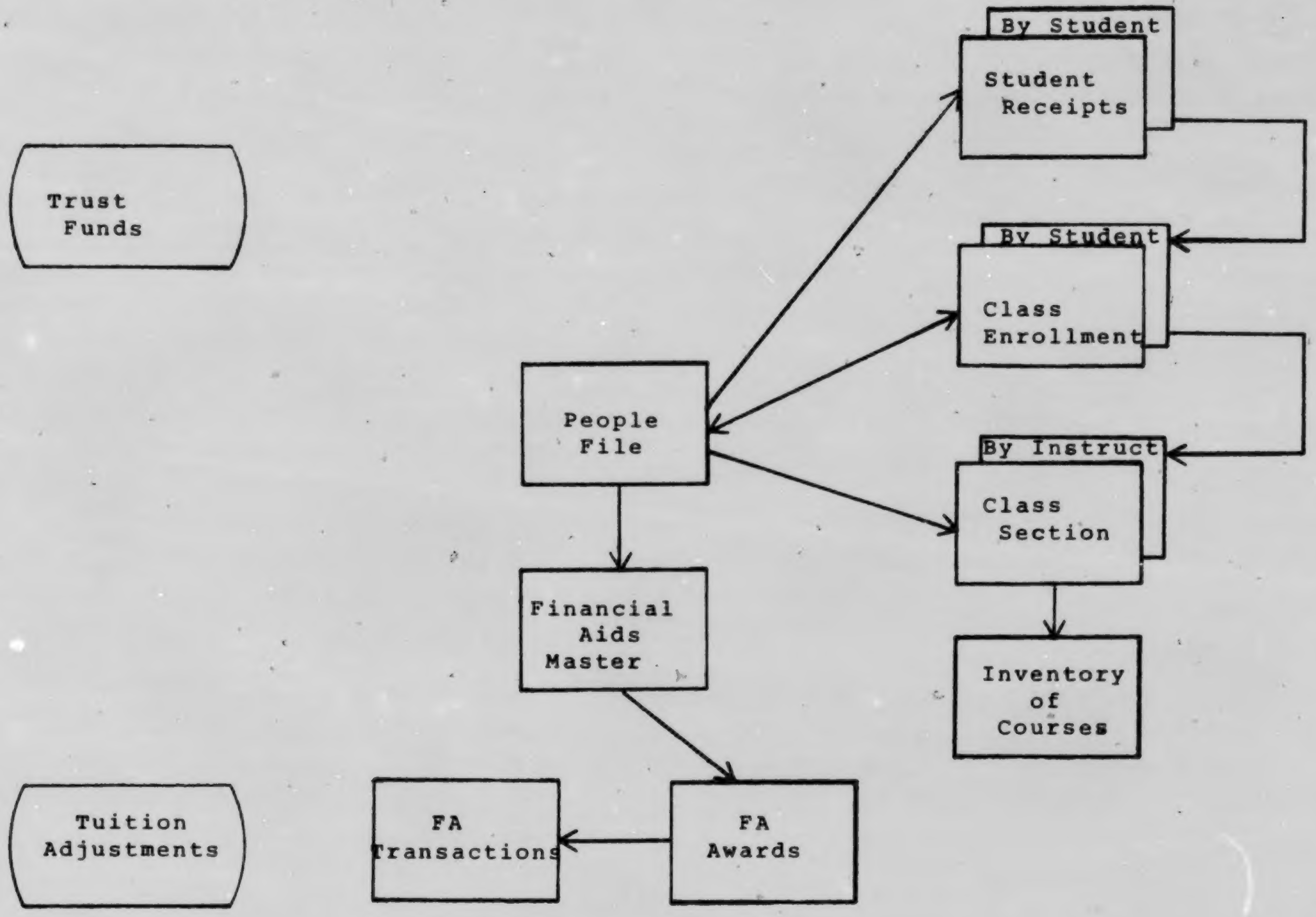
File Descriptions

People File

The People File is the nucleus of the data base. It is a RANDOM file which contains information about each student, faculty and staff member. Examples of data found in this file are social security number, name, sex, birthdate, and address. This file is accessed through the Social Security Index File or by pointers from other data base files. There are pointers from this file to the Receipt File, Class Enrollment File, Class Section File, and Financial Aids Master File.

Class Enrollment File

The Class Enrollment File is built at registration. As a student enrolls, a record is written in this file for each course in which the student enrolls. The course records are chained together for each student. Also, after registration ends, these records are chained together by class section. This gives the users the ability to display a student's schedule or an entire class section on a CRT. Examples of data found in this file are department, course, section, and grade. This file is accessed through the People File or other data base files having pointers


By Student
Student Receipts
Trust Funds
By Student
Class Enrollment
People File
By Instruct
Class Section
Financial Aids Master
Inventory of Courses
Tuition Adjustments
FA Transactions
FA Awards

DATA BASE FILES USED IN REGISTRATION

Diagram 3

to it. This file points back to the People File and also has a pointer to the Class Section File.

Receipt File

The Receipt File contains a record of each student receipt (registration, adds and drops, special dorm payments, etc.) for each semester. These receipts are chained by student. This file contains the detail of all fees paid at registration time. Examples of data found in this file are gross tuition, net tuition, lab fees, financial aid credit, and date. This file is accessed through the People File and points to the student's first class in the Class Enrollment File.

Class Section File

This file contains a record for each course section taught during the current semester. This file is chained by instructor and by building and room. This gives the user the ability to inquire on all sections taught by an instructor or all sections taught in any given room. Examples of data found in this file are department, course, section, time of class, capacity of class, and room number. This file is accessed through the People File and other data base files that point to it. Each class section record points to the instructor for the course in the People File and the first class in the section chain in the Class Enrollment File.

Inventory of Classes

This file contains a record for all courses that were ever taught at SWTSU. Examples of data found in this file are department, course number, course description, and lab fees. The file is accessed through a department course index or through the Class Section File.

Financial Aids Master File

This file contains a single master record for each student for each base year. Each record contains information required to determine financial need and eligibility. This file is accessed through the People File and has a pointer to the Financial Aids Award File.

Financial Aids Award File

This file contains a record of each financial aid award that a student has received. These awards are chained together by student. Each award record has a pointer to the most current financial aid transaction on the award in the Financial Aids Transaction File.

Financial Aids Transactions File

This file contains all financial aids transactions. The transactions are chained by student. This gives the user the ability to display all transactions for a student. The file is accessed through the Financial Aids Award File.

Tuition Adjustment File

This file contains a record for each student who has a tuition adjustment. This fee adjustment is given at registration time. This is an ISAM file which is keyed by social security number. The file is rebuilt for each semester.

Miscellaneous Code File

This file contains general purpose data that is frequently used by many programs. At registration, the student fees are retrieved from this file.

Trust Fund File

The file contains a record of student deposits such as property deposits and dorm deposits. The registration system checks this file to see if the student has paid the property deposit. If the student has not paid, the system will charge the student for this fee on the registration receipt.

Registration Subsystems

The Registration System has a number of major subsystems which include automated adds and drops, a tuition adjustment billing system, automated dorm/meal refunds, and registration reports.

Add/Drop System

The Add/Drop System is an on-line system which computes all add/drop fee transactions and determines the new schedule for the student. An add/drop receipt, which shows the student's new schedule and the fees for the course change, is printed by the computer. A record of each add/drop transaction is stored in the Receipt File and this information is used for the computation of future add/drop transactions and for the generation of refunds. These transactions are processed at prescribed refund times and refund checks are generated on the computer and posted to the Accounting files.

Tuition Adjustment Billing System

This system generates billing reports on all tuition adjustment programs that must be billed and reports on all tuition adjustments that are given at registration. The information that is required to generate these reports is stored in the Receipt

File.

Dorm/Meal Refund System

This system automatically computes a student's refund when a student withdraws from school by using the records of dorm/meal payments which are stored in the Receipt File. The system also computes refunds or additional charges when a student changes dorms or meal plans. Dorm/meal refund checks are generated by the computer and posted to the accounting files.

Registration Report System

There are numerous financial reports that are generated from the registration data. The main reports are as follows:

1) Registration Receipt Report - This report is produced both numerically and alphabetically. It contains the detail of all fees collected at registration and the total of tuition adjustment and financial aid credits.

2) Add/Drop Receipt Report - This report contains the detail of add/drop transactions.

3) Registration Cashiers Report - This is a report of the money that was collected by each cashier at registration. It is used as a balancing tool at registration.

Document 1 contains a list of other reports that are generated from the registration data.

Registration Financial Reports

Numerical Receipts Report
Alphabetical Receipts Report
Add/Drop Receipts Report
Cashier's Report
Financial Aid Credits Report
Tuition Adjustments Report
Dorm/Meal Payments by Dorm
Audit Class Enrollment Records with Receipts
Trust Fund Reports (general property, dorm deposits)
Special Dorm/Meal Payments
Returned Items Report
Add/Drop Refunds Report
Dorm/Meal Refunds Report

Document 1

Payroll/Personnel Data Base

The primary files that are used in the payroll/personnel area are shown in Diagram 4. These files include the Salary Budget Transaction File, Salary Appointment File, Wage Appointment File, Payroll Transaction File, Personnel File, Payroll File, and Deduction File.

File Descriptions

Salary Budget Transaction File

The file contains a record of each budget transaction on salaried personnel. Examples of data found in this file are social security number, account number, budget item number, amount of transaction, and date of the transaction. This is an ISAM file.

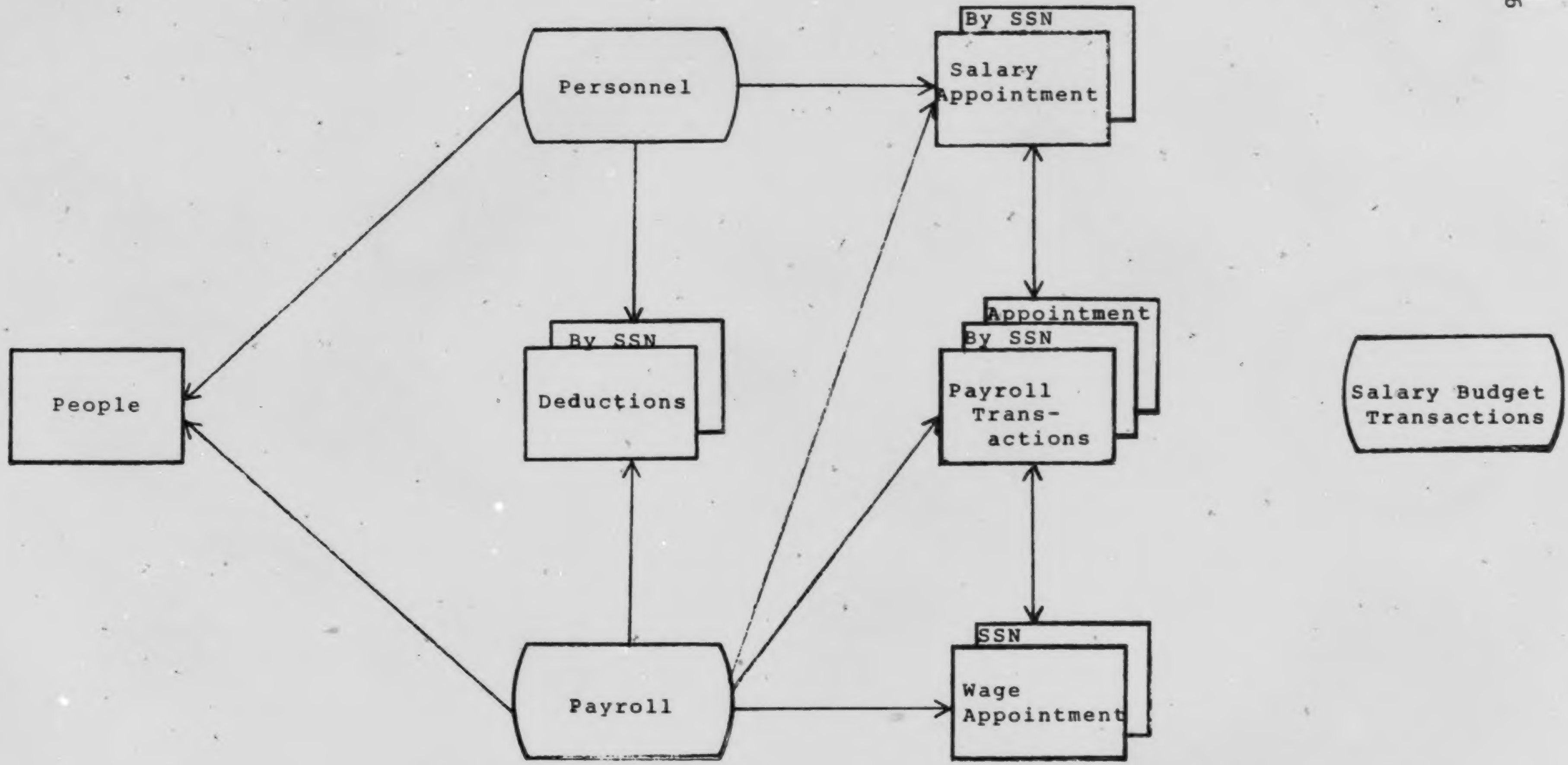
Salary Appointment File

This file contains a record of all appointments for salaried personnel. The file is chained by social security, which gives the user the ability to display all appointments for an individual on a CRT. Examples of data found in this file are paystep, contract dates, amount of appointment, distributed amount and job code. This file is accessed by going through the Personnel or Payroll File. Each appointment has a pointer to the last payroll transaction for the appointment.

Wage Appointment File

This file contains a record of all appointments for wage personnel. This file is also chained by social security number. Examples of data found in this file are account number, accumulative hours, standard hourly wage, and weekly hours for the current

Diagram 4


Personnel
By SSN
Salary Appointment
People
By SSN
Deductions
Appointment
By SSN
Payroll Trans-actions
Salary Budget Transactions
Payroll
SSN
Wage Appointment

PAYROLL/PERSONNEL DATA BASE

payroll. This file is accessed by going through the Payroll or Personnel File. Each appointment has a pointer to the last payroll transaction for the appointment.

Payroll Transaction File

This file contains a detailed record of each payroll transaction. This file is chained by both social security and appointment. This gives the user the ability to display all transactions for an employee or only those transactions for a given appointment for an employee. Examples of data found in this file are transaction amount and payroll deductions. This file is generally accessed through the Payroll File, however, this information can also be retrieved through both appointment files. Each payroll transaction points to the appointment from which it was generated.

Personnel File

This file contains a record for each faculty and staff member. Examples of data found in this file are employment date, faculty rank, office building, office room, phone number, and vacation and sick leave information. This is an ISAM file which is accessed by social security number. There are pointers from this file to the Deduction File, Salary Appointment File, and People File.

Payroll File

This file has a record for each individual that is employed by SWTSU. This file is also an ISAM file that is accessed by social security number. The file contains all payroll accumulators such as FICA and retirement deductions. It has pointers to both appointment files, Payroll Transactions File, Payroll Deductions File, and People File.

Payroll Deductions File

This file contains the detail deduction information for each employee. Three-letter codes are used to represent each deduction. The chaining in this file is by social security number. Access to the file is through either the Payroll or Personnel File.

Payroll/Personnel Reports

There are a number of reports that are associated with this system. Document 2 contains a list of the main reports. Also, there are numerous inquiry capabilities which include individual payroll deductions, salary budget transactions, individual appointments, personnel data, payroll data, and payroll transactions. There is also a generalized report generator which allows some reports to be customized.

Payroll/Personnel Reports

Work Retirement Report
Teacher Retirement Report
Optional Retirement Report
Annuity Deferred Income Report
Check Distribution
Check Registers
Multivendor Voucher Detail
Vendor Report
Alpha Transaction List
Payroll Distribution Report
Work Study Report
Payroll Detail
Salary Budget Report
University Directory
Employees and Deductions
Employees by Job Code
Leave Reports
Coordinating Board Reports
HEGIS XI Report
EEO-6
Faculty Analysis
Personnel Statistics Reports
Insurance Reports

Accounting/Purchasing Data Base

The primary files used by Accounting and Purchasing are shown in Diagram 5. These files include the General Ledger File, Subledger File, Accounting Transaction File, Vendor File, Encumbrance File, Auxiliary Services File, Returned Items File, and Contract and Grant File.

File Descriptions

General Ledger File

This is an ISAM file which contains a record for each of the university's general ledger accounts. Key data elements in this file are year-to-month and month-to-date debits and credits, general ledger name, general ledger number, fund code, and debit/credit balance code. The file is accessed by a four-digit general number. The user can display the debit or credit balance of each general ledger. Also, general ledger bank accounts are checked for the availability of funds as transactions are processed.

Subledger File

This is an ISAM file which contains a record for each of the subsidiary accounts. The expenditure accounts are budgeted for wages, travel, operating, capital, computer services, administrative salaries, faculty salaries, and classified salaries. Funds within these accounts are controlled by these objects of expenditure. If financial data entry personnel were to enter a transaction that would overexpend one of these categories, a message would be displayed on the CRT and the transaction would be terminated. This file is accessed by a five-digit subledger number.

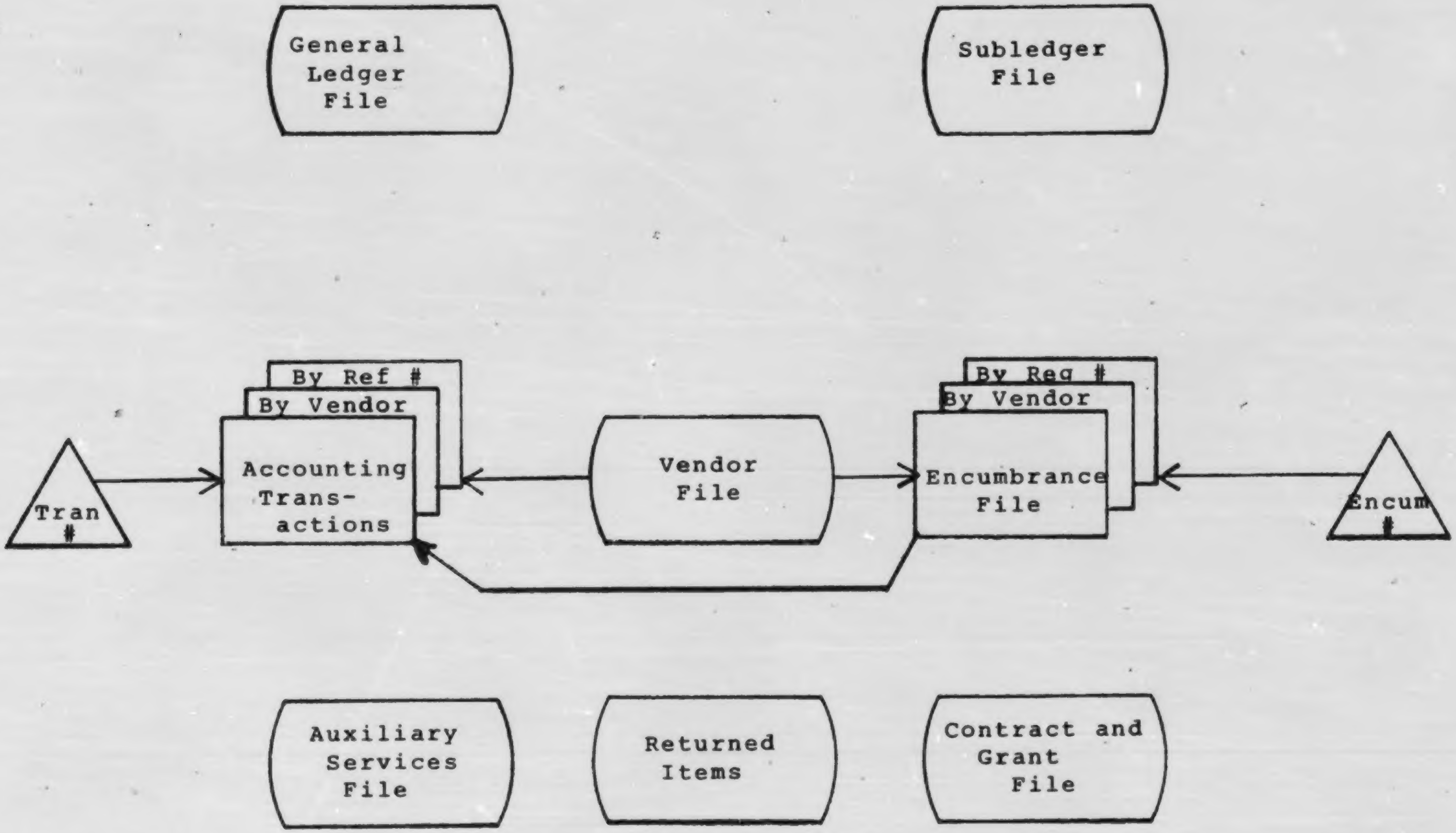

General Ledger File
Subledger File
By Ref #
By Vendor
Accounting Trans- actions
Tran #
Vendor File
By Req #
By Vendor
Encumbrance File
Encum #
Auxiliary Services File
Returned Items
Contract and Grant File

Diagram 5

ACCOUNTING DATA BASE

The activity in any account can be displayed on a CRT.

Accounting Transaction File

This file contains the detail of each accounting transaction. This file is chained by vendor and by transaction type/reference number. This gives the user the ability to display all the activity for a vendor and all transactions associated with a given reference number. Examples of data found in this file are amount of transaction, general ledger accounts, subledger account, object code, date, and vendor number. This file can be accessed through a Transaction Number Index File or the Vendor File. The detail transactions in this file will balance with the accumulators in the General Ledger and Subledger Files.

Vendor File

This file contains a record for each vendor that does business with SWTSU. The file is ISAM and is keyed by a nine-digit vendor number that is assigned by the university. Examples of data found in this file are vendor purchase and pay addresses and vendor name. This file points to the last transaction for a vendor in the Accounting Transaction File and the last encumbrance for the vendor in the Encumbrance File.

Encumbrance File

This file contains the detail of all encumbrances. The file is chained by vendor and by requisition number. The requisition number consists of account, fiscal year, and sequence number. Inquiries can be made for all encumbrances to a vendor, all items on a requisition, and all requisitions for any account. This file points to the last voucher paid on an item. Examples of data found in this file are encumbrance amount, liquidated amount, vendor number, account number and encumbrance date. This file is accessed through the Encumbrance Number Index File or the Vendor File.

Auxiliary Services File

This file is used to group various objects of expenditure together for the auxiliary accounts so that customized profit and loss statements can be generated. This file contains records of current year expenditures and last year expenditures so that comparative reports can be created.

Returned Items File

This file contains records of all returned checks received by the University. Letters of notification are generated from this file. Examples of data found in this file are date of check, social security number and dates that letters were sent.

Contract and Grant File

This file contains a summary of accounting transactions from which the monthly expenditure reports for contracts and grants are generated. Examples of data found in this file are expenditures for each budget item range for each grant account, beginning and ending dates for each grant, and an indicator used to determine how to compute indirect costs.

Major Accounting Subsystems

The Accounting/Purchasing System has a number of major subsystems which include automated state and local purchase vouchers, data entry systems, and report systems.

1) State Vouchers - State purchase voucher data is entered via a CRT and stored in a temporary file. This data is summarized each night and used to print and post state vouchers. This data was summarized manually in the past and the vouchers were typed.

2) Local Vouchers - Data for the local vouchers are entered via a CRT during the day and voucher checks are printed and posted at night.

Data Entry Systems

Accounting data is entered by the user departments via CRT's. There are customized entry programs for each transaction type (receipts, vouchers, general journal entries, budget transactions, etc.). Data is carefully checked at entry time to eliminate bad data such as inaccurate account numbers. Fund balances are checked to eliminate overexpenditures. Messages are displayed which warn the entry person of errors that are made when they occur. Also, data is generated by the entry programs, when possible, to ease the data entry burden. For example, if a subledger account is entered, the computer program will automatically select the correct controlling account. If the transactions are entered in batches, the entry program will ask for the batch total after the batch is entered. If the total that is entered does not match the total that was accumulated by the program, the entry person must find the error and correct it before the batch will be posted.

Report Systems

Numerous financial reports are created from the financial files. These include journals and registers for vouchers, receipts, and budget transactions, chart of accounts, income and object class analysis, restricted fund budget item analysis, and a trial balance.

These reports are used to balance the accounting files monthly to insure data integrity. Document 3 is a list of the key financial reports.

Financial Reports

- Voucher Journal and Register
- Receipt Journal and Register
- Budget Journal and Register
- Journal Voucher Report
- Appropriation Ledgers
- Statement of Realization of Estimated Income
- Subsidiary Schedules
- Trial Balance
- Current Status of Departmental Balances
- Income Object Classification Report
- Budget Item Analysis
- General Ledger Chart of Accounts
- Subsidiary Chart of Accounts
- Outstanding Encumbrance Report
- Daily Transaction Lists
- Contract and Grant Monthly Expenditure Report
- Auxiliary Services Profit and Loss Reports
- Budget Reports
- Local Funds in State Treasury

Keys to the Development of an On-line System

Most of the suggestions in this section are goals toward which a data processing department should strive. These goals will never be completely attained; however, the degree to which they are achieved will determine the quality of the systems that are developed. In the development of any system, there should be good communication between the users and the data processing staff, an emphasis on exactness, tight data editing, and anticipation of potential errors.

A weakness in any one of these areas will result in an increased workload for both data processing and user departments. The extent to which these goals are attained will be determined more by the attitudes of the personnel developing the system than by their technical expertise.

Communication is the key to the development of any technical system. Procedures that are established for any system should be carefully examined by all personnel that are responsible for the system. The ultimate responsibility for a financial system resides with the financial personnel. They will be working with auditors on any questions that may arise over financial procedures, so they should play a major role in the development of all procedures. Data processing personnel should make suggestions about any procedural changes they feel would be helpful. These suggestions should be examined by the financial personnel and implemented if the result would be tighter control. If weaknesses in the new approach are detected, they should be pointed out to the data processing staff and the procedures should be modified or rejected.

This approach to the development of procedures for an automated financial system is consistent with the concept of "separation of tasks", which is a part of any good manual financial system.

A financial system must be exact. Debits must equal credits, subsidiaries must balance to their control accounts, and receipts and vouchers that are computer generated must be exact. This goal is difficult to achieve and maintain. New laws and requests for change require constant modifications to a system. With each modification, there is the possibility of introducing "bugs" into a system. Inaccuracies in a system result in increased workloads for both user departments and data processing staff that are responsible for maintaining the system. An inaccurate automated system can easily generate more work than it saves. A thorough job must be done in analysing any changes that must be made to a system. The modified system should be tested for potential problems. If the modification to the system will possibly create problems, the user department should be notified. Users should be encouraged to notify the data processing department if problems arise. It is important that any problems created by a modification to a system be found as soon as possible, while these changes are fresh on everyone's minds. A financial system should be constantly monitored to ensure its accuracy. The system should be balanced each month.

Data should be carefully checked at entry time. Inaccurate data should never be allowed into the system. Account numbers that are entered should be checked to ensure that they are on the chart of accounts. Dates should be checked to ensure that month and year are correct. Invoice numbers should be checked to stop double payment. Fund balances should be checked to stop overexpenditures, and all expenditure/income coding that can be verified should be. When bad data is entered on the terminal, a message should be displayed which clearly explains the problem. For example, a bad account number entered into the computer may result in the message "INVALID ACCOUNT PLEASE ENTER AGAIN". The only way to ensure accurate data is to verify it at entry time. Once the data has entered the system, the problem of correcting it will be magnified.

All systems should be examined before they are released to see what potential problems may arise. Anticipating these problems early and correcting them before they occur can save both the user departments and data processing department many headaches in the future. Procedures established for running a job should be viewed in light of the question, "What can possibly go wrong?". For, if a problem can happen, given enough time, it will happen. For example, if payroll transactions can be double-posted, the accident will eventually occur. Once an unanticipated problem has occurred, care should be taken to modify the system so that the problem does not recur. Another problem that must be anticipated in the design of an on-line system is that of computer "crashes". When a transaction is entered, numerous files are updated. If the computer system goes down during this update, some files will be modified by the transactions and others will not. The result is an accounting system which is out of balance. It is not practical to restore all the accounting files each time there is a crash. All accounting data since the last restore would have to be reentered. To alleviate this problem, we recreate account activity from the detail transactions each month. Therefore, if the computer goes down during the entry of a transaction, the entry personnel check, when the computer comes back up, to see if the transaction is in the Accounting Transaction File. If it is, the transaction did occur, and if it is not, the transaction will be reentered. After the system is balanced each month, the monthly activity is transferred to fiscal year-to-month accumulators and the monthly accumulators are cleared.

Transfer of Software to Other Universities

Several Texas universities have acquired copies of our software. Recently, Pan American University took copies of our registration software. They made some modifications to the system to increase throughput and we are now examining these changes to see if they should be incorporated into our system.

Our most ambitious undertaking was the implementation of the entire Fund Accounting System at Texas Women's University. In the fall of '78, the financial personnel of TWU visited SWTSU to view the automated accounting systems. Subsequently, the personnel at TWU decided to acquire all of the fund accounting software. They also adopted, with few modifications, our financial coding structure. Their goal was to implement this software for fiscal year 1980.

A task force was formed at TWU to work with our financial and data processing personnel to coordinate the implementation of the Accounting System. This group included an internal auditor, the comptroller, and their financial programmer. It was their job to work with us to learn our system and then train the staff at TWU. This would be a monumental task because of the radical change from a batch to an on-line system and the changes to their accounting coding structure and procedures.

The task force visited our site several times in the spring of 79, and we also kept in touch by telephone. Test runs were made on the new system in the summer. They are now running most of their accounting applications on the new system. Most of the problems that they have encountered so far have been minor, however, they are still not completely through with the project.

Conclusion

The development of an on-line financial system is a major project. The key to the success of such a project is the committment of both the financial and data processing personnel to the project. Once the system is running, there must be a continuing committment to the maintenance of the system. Data processing personnel must be informed of potential changes to the system as soon as the financial personnel are aware of these changes.

If the system is properly maintained, the result will be better financial control with a lightened workload for the financial staff.

TRACK IV
SMALL COLLEGE INFORMATION SYSTEMS

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An Evolving Urban University: The Role of Information Systems

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Washburn University of Topeka, Kansas enters the decade of the 1980's with a clearly articulated mission. The faculty and administration intend to transform this municipal university into a truly urban university. They acknowledge the centrality of information and planning in this effort. Information systems provide the foundation for rational planning and the management of limited educational resources in the pursuit of this goal. Developed planning systems allow informed choice within established boundaries.

This paper will describe the development of a planning agenda for the achievement of the basic university mission. The paper follows the process from the realization that "seat of the pants" and "we've always done it that way" were no longer sufficient to the implementation of complex mathematical simulations of the University. The management of change necessitates the commitment of the executive administration, the acceptance of academic administrators and budget managers and the education and participation of faculty, staff and external constituencies. The process ultimately allows the evaluation of alternative paths to the future within the confines of financial reality and accepted mission.

Finally, this study demonstrates the relevance of the single institution planning process to the broader concern of higher education coordination, in this case within the state of Kansas.

The management of educational resources has been radically altered in the past decade. The brief interlude of sustained growth has begun to fade. The administration of growth after World War II and more recently after 1957 presented a vastly different set of choices than does the growing realization that we must face the management of decline or at best a stationary state. As the 1970s began a few recognized the management challenge and addressed it forthrightly.

The crack of automatic rifle fire ushered in the decade and the 70s tragically closed the previous one. The new decade saw the tentative beginning of genuine planning in Higher Education. Washburn University of Topeka, Kansas, however, entered the 1970s already committed to the planning process. (Let me parenthetically introduce Washburn University. Located in the Capitol City of Kansas, Washburn is the last truly municipal university in the nation. The University grew from a small congregational college and today enrolls nearly 6,000 students. The College of Arts and Sciences combines with the School of Business and School of Law where students pursue their studies in a wide range -- two and four year programs -- liberal arts and professional.) The University had begun its long search for an educational Oz or the comfort of its corporate Aunt Em and Uncle Henry some years earlier. Shortly after 7:00 P.M. on Wednesday, June 8, 1966, a tornado roared over Burnett's Mound on Topeka's southwest boundary and moved northeastward across Topeka. Eight campus buildings were completely destroyed. Every other building was severely damaged. Six hundred trees fell. Amidst the rubble the University faced the future boldly in 1966 and then continuously through the ensuing thirteen years.

1980 brings to an end this enforced rebuilding and planning project. The final building in our reconstruction will be nearly completed. However, universities, as we all know, are much more than bricks and mortar. The University planned for physical survival. Now we must consider the future in much broader terms. We must examine the future of academic programs; we must attempt to discuss the educational imperatives and possibilities. Washburn will not again allow the planning process to assume the incalculable burden of raising a Phoenix.

The administration of Washburn University is committed to informed management. We accept that planning demands informed choice, not seat of the pants-intuition or we've always done it that way. Rationale decisions and planning is dependent upon information. The most useful analogy here may be the simple classical economic model. This model assumes informed choice -- indeed perfect knowledge. It would be presumptous to assume perfect knowledge in the academic planning process, however, we must make the attempt to secure, or construct relevant information.

The first essential lesson in the planning process, the development of PMS or MIS, is that the University administration must be committed to the concept. Although external agencies, Regional Accrediting and The State of Kansas, mandated planning procedures, the impetus for program planning came from the academic administration and faculty. Indeed the faculty, finally realizing the possibility of decline, requested an expansion of the planning process.

The University adopted an agenda for the planning process. This included the following steps.

I. The definition of planning assumptions
II. The acceptance of goals and objectives
III. The implementation of MIS/PMS
IV. The establishment of review procedures
V. The coordination of planning activities

I. Planning Assumptions

The development of a set of planning assumptions has been a most useful and informative process. It has forced regents, administrators and academic program managers to specify their own operative view of the University as it is now and will be for the next few years. This specification process initiated a review process which proceeded through the various levels of administration to the Board of Regents. Finally the University arrived at a set of clearly defined assumptions essential to the planning process. Although, it is impossible to achieve unanimity the process results in assumptions which are clearly stated and published. It should be obvious that assumptions are necessary to the planning process; Parameters within which we can reasonably predict. In our case for instance it might change the scope of action considerably to alter the control structure.

II. Goals and Objectives

Although the process of Goals and Objectives definition clearly overlaps that of the previous discussion, it is a distinct phase. Planning assumptions are real or perceived parameters to the planning process. These assumptions at least partially define paths or often roadblocks to the achievement of the accepted goals and objectives.

Washburn University has accepted a conceptual mission. Through a process of evolutionary development the University has moved from a church related college, to a municipal college with an adjunct law school to its current status as a municipal university, attempting to become an urban university. Although this smacks of catalog platitude, Washburn intends to become a truly urban university. The specific goals (educational roles and program objectives) within this general statement required a long process of discussion, evaluation and consideration.

One result has been the acceptance of a more diverse educational mission. This has meant the expansion or proposed expansion of community based programs, professional programs, associate degree programs and emphasis on continuing education. The problem, until recently, was how do we plan this development, how do we evaluate and estimate the impact of proposed actions? What are the likely results of a particular proposal given our assumptions and the result relative to our stated goals and objectives. In fact several programs were initiated without consideration of important variables. These programs had been carefully considered but had not been the result of a careful planning process.

The necessity of a true MIS/PMS gained general acceptance. The concurrence of Board of Regents, The North Central Association and the faculty and administration resulted in a planning program. The University recruited personnel to manage the process and began to identify the necessities.

The development of our PMS/MIS depended upon the answer to four questions:

1.) How extensive is the management and planning function to be fulfilled?
2.) Is the institutional commitment sufficient to support the system?
3.) Do machine compatible operational systems exist?
4.) Is the hardware sufficient for the purpose?

Question one essentially asks for a functional definition. To many a time bound snapshot of the educational enterprise in a given semester is sufficient. Combined with comparable historical information all necessary "analysis" has been completed. Eyeball comparison and relationship definitions are the usual analytic tools. These operational and management reports are extremely useful and indeed are the first and second steps in any genuine planning process. However, a necessary final step demands genuine analysis.

In order to proceed to a planning model, the historical and contemporary information must provide quantified estimates of the relationships between the elements of the institutional construct, a model. The difficulties in building a planning model include:

1.) The definition of all elements
2.) The discovery of all relationships
3.) Sufficiency of data to fuel the model
4.) Commitment to the concept of planning

Washburn University decided initially to combine two useful conceptual frameworks. First the NCHEMS Costing and Data Management Model provided a sufficient foundation. The staff then adopted the Warnier-Orr structure for system definition.

The National Center for Higher Education Management Systems, (NCHEMS) was organized initially as an adjunct to a consortium of Western States, The Western Interstate Commission for Higher Education (hence NCHEMS at Wiche).

Financed by the federal government, NCHEMS' personnel initially concentrated on the development of a universally applicable planning and management system. Responding to the requirements or perceived needs of the funding sources and the statewide coordinating agencies the center offered a set of Information Exchange Procedures or conventions (IEP).

NCHEMS entered the pilot testing and implementation phase of their costing system and IEP in 1972. In Ohio, Texas, Michigan and Wisconsin, individual institutions were asked to feed what seemed to be an insatiable datavore, or uniform reporting system. The first experience of many with NCHEMS or similar groups was as an externally imposed system. MIS-PMS continue to be viewed as a threat. The emphasis on IEP, compatability and comparability, created an early misunderstanding.

Although IEP remained in the forefront and the disaffected sharply outnumbered proponents at most NCHEMS meetings, the single institution experience managed to intrude. In 1972 one of the first pilot test reports presented the record of the implementation process and results at California State University at Fullerton.

(Fullerton's implementation resulted from legislative and system office mandate). NCHEMS published the record of implementation programs at:

Georgia Tech
University of Scranton
Triton College in Illinois
New Mexico Junior College

These reports indicated that a primary result of MIS-PMS, despite external pressure, was the development of useful, useable internal management and planning information. Although inter-institutional comparison can be useful and meaningful, given comparable compatible data, intra-institutional information proves most useful. The following provides a brief overview of the NCHEMS Costing and Data Management System.

The NCHEMS Costing and Data Management System is a student or enrollment driven management information system and planning model. The system concerns itself basically with either the direct instructional cost or the full cost (unless the information obtained is used for information exchange purposes the choice remains with the institution) or student programs and academic disciplines or departments. The general system is subdivided into seven modules. The first five modules provide snapshot and historical information while the latter two attempt 1.) to manipulate the data from the other modules and provide final management reports 2.) to provide predictive information within the boundaries provided by the user.

I. Student Data Module - The Student Data Module accepts student registration data and produces a student major or program and academic discipline or department matrix. This manipulation relates semester credit hours to major and discipline. It shows total semester credit hours produced by departments and the distribution of semester credit hours consumed by student majors. Finally the Student Data Module creates a schedule for an average FTE student in each major.

II. Faculty Activity Module - The Faculty Activity Module has little relevance to a predominately teaching university, but still warrants some consideration. This module provides procedures to obtain and process information about faculty: The time devoted to various activities, the perceived outcomes of these activities and the budgetary accounts that support each activity. NCHEMS suggests that faculty activity data be derived from a Faculty Activity Analysis self-reporting instrument. This form asks that each faculty member report teaching load, research activities, community service, professional development and related professional activities and the approximate percentage of time devoted to each.

III. The Personnel Data Module - The Personnel Data Module accepts data from the Faculty Activity Module and/or Personnel Informational System. (Initially the most useful information is gained by bypassing the Faculty Activity Module). It aggregates or disaggregates the data into a set of costable activities. Additionally, the Personnel Data Module receives student credit hour data from the Student Data Module.

IV. Account Crossover Module - The primary function of the Account Crossover Module is to transfer institutional account balances to a structure compatable with the remainder of the costing system. It forwards data to both the Data Management Module and the Personnel Data Module.

V. The Student Outcomes Module - Although the Student Outcomes Module is schematically linked to the Data Management Module, it is best utilized as a separate and distinct system. In its original form this module solicited data from program completers. The revised version seeks longitudinal information on the institution's student body. Questionnaires include an entering student, non-returning student, graduating student and recent alumni form.

Two Final Secondary Modules remain:

I. The Data Management Module - The Data Management Module stores, displays and manipulates data received from other modules. The derivation of full costs - Allocation of indirect costs + Direct Costs - is a principle function. The Data Management Module finally derives unit cost/discipline credit hour and cost/student major.

II. RRPM-1.6 - The Resource Requirements Prediction Model provides a computerized approximation of the University. The model accepts assumptions derived from historical full cost studies and accepted goals and objectives and works through the process into some future. RRPM-1.6 allows the determination of marginal cost and quickly extrapolates assumptions. Again remember this is only an approximation and is dependent upon the validity of the assumptions.

The Warnier-Orr system provided the structure for the entire MIS. Washburn finds itself uniquely situated since Langston and Kitch, one of the foremost groups in structured systems, is located in Topeka. The Warnier-Orr structure allowed the definition of the planning system from the top down; from the most aggregate to the individual data element.

The Warnier-Orr structured system approach is a global outgrowth of the developments in structured programming in the early years of the decade. This tool proved extremely useful in the logical definition of our system, in the documentation of the system and indeed in its implementation.

The Warnier-Orr diagram replaced the flow chart and mapped the system from the most general to the most specific. Some of this may appear unnecessarily loaded with jargon. Indeed a model or a Warnier-Orr Diagram at its simplest may conveniently be viewed as an outline. However, they provide for much more. A model hopefully allows us to manage change and structured techniques provide a means for the analysis of the concurrent systems developments. Structured systems design assists in the development and creation of the data lines necessary to fuel the planning model. Importantly the cost of system development can be reduced.

The analysis of the University's situation using the structured systems technique combined with the NCHEM CADMS yielded valuable results. We specified the relationship between the various system elements and discovered any data deficiences.

What data is necessary and what management information can be gained: The "Data Base" must include computerized:

A.) Student Records - Registration System
B.) Budget System
C.) Accounting System
D.) Personnel Payroll System

Logically these systems may be linked in an actual data base which serves all operational requirements as well, or separate distinct operational systems may forward necessary data elements to separate MIS-PMS modules. Currently Washburn University possesses distinct student records and accounting systems. The current personnel system excludes all but classified staff, although the payroll section includes all university personnel. The administrative IBM Systems Three mini computer currently handles the systems mentioned. This machine possesses neither the size nor the power necessary for a university planning and management model; nor does the current Academic IBM 360-30 computer. The commitment mentioned above must also include the provision of computer hardware sufficient for this purpose, including equipment for communication with the Systems Three.

The MIS-PMS, correctly designed, will provide a quantitative inventory, an academic enterprise profile. The first questions to be considered are 1.) What is the current situation? 2.) Does the recent past illuminate the course of development to this point? The answers to these questions then must be tied to goals and objectives in an examination of the many possible futures.

What quantitatively defines the current situation and the recent past? A partial list might include:

I. Student - Program - Discipline Information
  a.) Student majors - by classification
  b.) Student enrollments - by division
  c.) Student semester credit hours - by division
  d.) A program - discipline matrix

II. Student flow information
  a.) Retention - attrition information
  b.) Career decision matrix

III. Financial - Information
  a.) Direct instructional expenditures - discipline
    1. Budget projection
    2. Actual - previous fiscal year
  b.) Total expenditures by budget unit

IV. Faculty - Information
  a.) Faculty salary information
  b.) Faculty workload
    1. Faculty activity
    2. Budget - registration link
  c.) Instruction - research - service
  d.) FTE faculty

V. Synthetic information
  a.) Direct instructional cost/credit hour/division
  b.) Total cost/credit hour/division
  c.) Credit hours/FTE faculty

VI. Outcomes information

The above information considered historically allows trend analysis and the partial definition of the relationships within the planning model. In other words the University's operational systems provide operational auditing and support the management information system. The MIS in turn provides management reporting (time capsule or snapshot reports) and supports the planning system (see Figure 1.)

The planning system allows the examination of alternative futures. The actual planning process must begin with the definition of goals and objectives. The quantitative approximation of the university provides for successive iterations using possible parameters for the future. Hopefully the model will provide a possible path (or paths) to the attainment of the goals and objectives. It is quite possible, however, that, given the current state of higher education, the examination will force a refinement of priorities, a rank ordering of goals and objectives.

Essentially the planning system provides management reporting for some future period. The system utilizes assumptions and constructs a snapshot. Those responsible for planning must examine this hypothetical profile and determine its feasibility, particularly its financial feasibility.

Planning is a continual process; progress along the path to the agreed future must be monitored. Deviations must be explained and may necessitate revision and reexamination. The commitment demanded for implementation does not cease with the first successful iteration. The administration, faculty and various constituencies must be continually involved in the process.

Let me return to the prerequisites. Although it is possible to generate much information manually, it is impossible to perform successive iterations. The provision of operational, management and planning information demands computer hardware and software.

Washburn confronted the computer requirement immediately in the process. Operational systems existed on a small IBM Systems 3 model 10. The academic areas possessed the processing capabilities of an IBM 360-30. The two machines were incapable and neither had sufficient primary memory to efficiently manipulate a planning model. A small university finds itself on the horns of a real dilemna. It cannot afford not to plan but it really cannot afford the expense of a modern computer of sufficient size and power to do the job.

To overcome this difficulty and reduce total cost, the University decided to link with a major computer system at Kansas State University in Manhattan, Kansas. Washburn purchased a multi-purpose mini-computer at about one-third the cost of a main-frame computer. KSU assumes the burden of system support, software expense, state-of-the-art hardware and we in turn reimburse them for processing cost.

The concept of educational computing networks is not new but will gain prominence as computer architecture more easily accepts this development. Networking will provide the answer to the computer support problems of many smaller schools in the near future. Those schools should look closely at computing philosophies and possibilities.

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Thus we come to the present. The University has completed the brick and mortar projects. A process of self-examination has been completed -- goals and objectives defined -- assumptions specified. A system has been designed and hardware acquired. Now we must continually review, revise and analyse the results. This planning process will, hopefully, provide an easier path through the next decade.

EVOLUTION IN PROGRESS
PME Development in a Small Liberal Arts College

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The conversion from a totally manual information processing system to a computer-based system is a slow and somewhat difficult process for the members of a small liberal arts college community. This paper will recount the experience of one such college for the past year and a half in trying to develop a usable and understandable PME. The paper will share ideas and perceptions with staff from other small colleges who may be involved in the same kinds of situations.

The PME tasks in small colleges center upon 1) selecting appropriate starting points for PME beginnings, 2) demonstrating how different procedures, techniques, or analyses can facilitate operations and decision making, and 3) educating people about how to participate in and contribute to the development of improved planning, management, or evaluation practices.

The author will use these three tasks as a context for discussing the specific PME efforts that have been conducted in the college during the past 18 months: Needs Assessments, Demonstration Projects, and Computerization of the Student Data Base.

Evolution in Progress
PME Development in a Small Liberal Arts College

The Theoretical Components of PME

One of the leading authorities on PME Systems portrays the elements of a planning, management, and evaluation system as a series of concentric circles, as shown in Appendix A. The author explains that:

> The outer ring represents the integrated planning, management, and evaluation components. The second ring represents the management systems that are used to integrate planning, management, and evaluation. The third ring illustrates the relationship of some of the more traditional management activities to the PME and supporting management systems. The elements in the center of the circle are management responsibilities that need to be carried out in order for the PME system to operate effectively.
> (McManis and Harvey, 1978: 9)

The basic premise of my presentation is that, in spite of the pretty symmetry of that paradigm, the development of an institution-wide PME system, in a small liberal arts college at least, is a very difficult and confusing process. Later, I will recount some of the experiences we've had at Marymount Manhattan College in the past year and a half in trying to develop a usable and understandable PME. But first, I will share with you my ideas about what a PME is.

At the start, I want to suggest that PME is not a system, and should not be explained to participants in technical systems terms. PME is a process. Like the budgeting process or the decision-making process, the PME is initiated, sustained and legitimized by the people who are involved in it. PME is an institution-wide, integrated process that happens because people make it happen. A type of planning activity, management operation, and evaluation procedure already do function in every viable institution of higher education. When an institution moves toward a PME, it is commiting itself to improving and enhancing the relationship among the planning activities, the management operations, and the evalution procedures.

Secondly, I want to suggest that the PME process is a very technical and sophisticated approach to the development and coordination of an institution. A successful PME process requires the balanced and ongoing integration of a viable planning process, a practical management approach, and an effective evaluation procedure.

Planning can be defined as a continuous and cyclical process through which the members of an institution reaffirm the mission and establish realistic goals and objectives which relate to and carry out the mission statement. (see Appendix B)

A viable planning process is characterized by:

- Its ongoing nature: it is cyclical and fed by new input and by the results of the evaluation process.
- Its realistic timetable: it is synchronized with other institutional activities and it can be accomplished within the time provided.
- Its comprehensiveness: it encompasses all units of the institution.
- Its integrated approach: it inter-relates all units of the institution.

Management can be defined as the processes and techniques which people use to achieve the objectives outlined in the planning process. (see Appendix C).

A practical management process is characterized by:

- Its process orientation: it is based on agreed-upon procedures techniques, sequencing, etc.

- Its focus: it is directed toward the articulated objectives developed during the planning process.

- Its feasibility: the institutional objectives are translated into activities or tasks for the various program units or staff members.

- Its understandability: policies, procedures, lines of reporting, and authority for decision-making are clearly documented, widely known, and fully understood.

- Its uniformity: the agreed-upon and understood policies and procedures are consistently followed throughout the institution.

- Institutional support: executive and staff personnel provide ongoing support to operational managers.

Evaluation can be defined as the process through which evidence is gathered to assess the actual performance of a group or activity in relation to expected outcomes and the objectives that were specified during the planning process. (see Appendix D)

An effective evaluation procedure is characterized by:

- Its process orientation: it assesses management outcomes in light of stated plans; the results feed into the next planning cycle.

- Its outcome orientation: it can focus on accomplishment outcomes, efficiency outcomes, or effectiveness outcomes, or on all of these.

- Its focus: it is directed toward the articulated objectives developed during the planning process.

- Its attempt to measure or compare: the measures may be quantitative or qualitative.

- Its comprehensiveness: some form of evaluation activity is performed in every unit of the institution.

To be effective, these planning, management, and evaluation activities must also be supported by an accessible and meaningful data base. And this data base must be used to produce information which is relevant to the planning, management, and evaluation decisions of the institution.

Unfortunately, most small colleges today are not prepared to adopt this type of comprehensive planning, management, and evaluation process. They are constrained by tradition, and lack of money and expertise. In this environment, PME development must occur in a rather piecemeal fashion with individual and somewhat unrelated projects being undertaken to improve a particular aspect of planning, management, or evaluation in the college. These improvement efforts must be carefully designed and sensitively implemented if they are to be successful. In the small college setting PME should not be a radical undertaking; rather, it should be an evolutionary process which uses the existing administrative/management situation as a foundation for incrementally building planning, management, or evaluation improvements.

PME Development At Marymount Manhattan College

Description of the College. We have used this incremental, or evolutionary approach to PME development at Marymount Manhattan College during the past year and a half.

Marymount Manhattan is a small liberal arts college in New York City. It was formerly an "extension-like" center of Marymount College in Tarrytown, New York, and a rather traditional Catholic college, with a homogeneous student body. In 1961 Marymount Manhattan College received its own charter and today it is an independent, secular institution offering a variety of undergraduate academic and pre-professional programs within the liberal arts tradition. The 2400 students are demographically and academically diverse. The faculty and administrators of the college are a mix of religious and lay, and they are predominantly non-technical people who use and value a personal approach in running the college.

In 1967 the college received an Institutional Development Grant under the Title III Program. This federal program is designed to strengthen struggling institutions which have the potential to move into the mainstream of the nation's academic life. Assistance was provided for both academic and administrative development. When this initial grant period expired, Marymount Manhattan applied for and received a second Title III Grant. One of the requirements for this second grant was the development of a Planning, Management, and Evaluation system. The college's proposal included a section on PME development - however, this section was written by an external consultant and it reflected a combination of his perception of the needs of the college and his knowledge of MIS and PME systems theory. Thus, the college administration itself had not identified and articulated its need for PME, and of course had not outlined its expectations for PME development. The college received the grant, and it then had to begin to implement PME development along with the other activities funded under the grant.

PME development really began with the search for a "PME Specialist". Organizationally, the PME position reported to the Assistant to the President, so that an institution-wide perspective could be maintained. This direct link to the President's office provided the added benefits of chief executive support and leadership that were necessary if PME was to succeed. I assumed this PME position in April, 1978.

I spent the first several months at Marymount Manhattan becoming familiar with the college, its administrative operations, and its staff. Some of the most significant characteristics of the administrative situation were:

1. The information system was totally manual. (This included Registrar, Student Accounts, Admissions, Financial Aid, Accounts Payable, and Personnel. As another part of the Title III grant, a systems analysis was being conducted in anticipation of computerizing many of these processes.)
2. There were very few documented and/or formally established policies and procedures.
3. The decision-making process was vague and rather ad-hoc.
4. The process for institutional planning was established and working. There was extensive student, faculty and staff participation; a well-developed mission statement and set of goals existed. However, the plan stopped short of establishing the management tasks that related to the goals, and there was no systematic way to translate

the institutional plan into action or to measure progress toward goals.

5. The annual budget process was classically incremental. Annual revenue estimates were based on annual enrollment projections, and very little attention was given to having the budget reflect the priorities in the institutional goals established in the institutional plan.
6. There was no systematic procedure for assessing management processes or personnel.
7. Insitutional research activities were neither centralized nor coordinated. Basic data collection efforts, like HEGIS reporting, were used only to meet external requirements. The other sporadic studies that had been conducted were usually single focused, and the results were rarely integrated into college-wide decision making.

This description of the administrative situation at MMC is given, not to hang out the dirty linen, but to point out the management realities which existed at MMC, and MMC is not unique. Similar descriptions could be given for many other small colleges. This observation is based on discussions with administrators at other Title III institutions, with staff from other liberal arts colleges, and with former colleagues of mine who are now working in institutions across the country. The problem that faces us is: Given this type of administrative situation, how does one go about developing a PME system that will be understood and used by college managers in the small college?

Needs Assessments. Being fresh from doctoral study and not fully realizing the administrative situation that existed at the college, I arrived as PME Specialist full of ideals and theories about facilitating the development of useful management indicators, institutional research reports, and integrated administrative systems based on users' needs and expectations. The first thing to be done, I believed, was a Needs Assessment so that the administrators could tell me what improvements they wanted and together we could develop them. I embarked on a series of interviews with top and middle-level administrators. These interviews were to serve as an individualized introduction to PME for each administrator and as the initial Needs Assessment for the PME activity. The interviews would provide the basis for suggestions to top adminstration about which areas should have priority in PME development.

Administrators were sent an agenda and a background paper entitled "What Is This Thing Called PME?" in preparation for the interview session. During the interview, adminstrators were asked what management reports and studies their office now prepared, what studies or reports prepared in other offices they used frequently, and what kinds of new procedures or reports would help them to do their jobs better.

My summary report of these interviews, made to the President, outlined suggested institutional research projects and identified some possible alternative directions for the development of PME. The suggested institutional research projects were rather typical and predictable, such as attrition studies, cost studies, workload studies, etc. The report to the President suggested that before any I.R. study was undertaken, the purpose of such a study and its potential benefit for college decision making or management should be articulated and priorities should be established. This, I knew, was necessary so that the study could be designed to provide the kind of information that was needed.

But the President and other top administrators could not answer what purpose or benefit they expected; in fact, they could not identify their priority areas. Discussions in which I tried to probe for these answers were somewhat counterproductive. I now understand that they had never had the experience of articulating their information and decision making needs before and did not understand what I was asking for. I had not clearly explained that what I was asking for was essential to insure that the research, analyses and reports would contain the kind of information that would be useful to them. And, without such an explanation, they could not respond. I soon gave up on this attempt to get direction and guidance for PME development, and turned to a second type of Needs Assessment effort.

This time I opted for a paper-and-pencil survey method which was based on an instrument found in the McManis and Harvey book, PME Systems in Higher Education (see Appendix E). This instrument, called the PME Checklist, seeks to measure people's perceptions about the state of a variety of processes and documents at the college which would characterize a successful PME. The results of the survey helped to identify strong or successful planning, management or evaluation elements and to suggest where weak areas might be.

The survey was sent to all chief administrators, middle managers, and academic chairpersons. The responses were analyzed, a written report was prepared, and the results were presented to top and middle-level administrators at a seminar-type meeting where the topic for discussion was PME development at the college. The results of the survey were very much as expected -- there was a high level of agreement that planning-related processes were in-place or being developed; there was rather wide dispersion of opinion about which management-related processes were working or even existed; and there was a consensus that evaluation-related processes were not developed or not known. The seminar was well received. Good discussion took place regarding the findings which emerged from the survey and the factors which lay behind some peoples' responses. It became clear that many peoples' perceptions were factually inaccurate and that the college had a problem with communication, awareness, and understanding among the various levels and offices. It was agreed that the college should devise ways to counter-act this problem because, if the communication problem was alleviated, the result would be an improvement in management processes.

The meeting ended on this positive note, with everyone assuming that some corrective actions would soon be announced. But nothing happened. There was no follow-up to the meeting or to the results of the survey. Thus, the second Needs Assessment effort also hit a dead-end.

Clearly, it was time to re-group. Six months and two Needs Assessments had gone by, and I was making little, if any, progress toward the purposeful and comprehensive development of a PME process within the college. If I was to be succesful, I had to find an approach which was more effective, which the people at the college could relate to, contribute to, and utilize; an approach which more realistically reflected the administrators' personal orientation and managment styles and techniques, and to use that approach as the basis for strengthening planning, management, and evaluation processes.

I decided that this theoretical, responsive approach I had been using was totally inappropriate in the Marymount Manhattan environment. I had been asking people to do a nearly impossible task: to precisely articulate data and research needs, to identify procedural and organizational needs, and to suggest solutions for improvements. The task was nearly impossible for two reasons. First, the college staff had had very little prior information or experience with such things as data-based reports and systematic management techniques, thus they had no frame of reference from which to answer my questions. And secondly, it is just plain difficult to precisely describe the present and future requirements of a human organization and its processes.

Instead of this theoretical approach, I had to find a pragmatic approach to PME development, an approach which did not directly depend, at least at first, on user input. I decided that the most promising path I could take was a Demonstration approach. Instead of asking people what they wanted, I would show them what was possible.

Two aspects of this approach required special attention. I had to select appropriate, relevant demonstration projects. If I selected well, administrators would realize the value and would, perhaps, seek to expand the project. Also, I had to maintain my credibility --

both professional and personal. If people believed that I was sincere in my efforts, that I was interested in improving the future, not condemning the past, the implicit fear of change might be alleviated. With this Demonstration approach, I hoped that college administrators would become more aware of PME possibilities and see more clearly how to use PME concepts and reports in college decision making.

Demonstration Projects. In order to determine what kind of demonstration projects to undertake, I reviewed the theoretical components of a PME system, the results of the two needs assessments, specific institutional research requests that had been made, my experiences at other institutions, and my general perceptions about Marymount Manhattan's PME needs. I decided not to focus on the planning component, because MMC people believed that the planning process worked well. And I did not focus on the evaluation component because I did not believe that an adequate data base existed to support the development of a comprehensive evaluation effort. My orientation, then, was to encourage the development of the management component of the college. This seemed the most tangible, relevant and potentially useful for overall PME development.

I began to seek opportunities to conduct management-oriented demonstration projects, and to publicize the results of these projects throughout the college (see Appendix F).

The Academic Dean was particularly helpful in this regard, for she asked me to undertake a series of research projects which she wanted to use as an aid in curriculum planning and academic decision-making.

In response to her requests, the first domonstration project consisted of a series of studies including:

- the courses taken by the 1978 graduating class
- the actual curricular offerings of the college during the past three years
- comparison of degrees conferred by subject area since 1972
- distribution of student grades
- faculty instructional workload since 1974

Although the Dean's request was that these studies be conducted for a particular period of time, I have updated these reports based on each subsequent semester's data, and provided comparative information. Thus, the reports continue to serve present-day academic decision-making needs and, at the same time, are beginning to provide a longer-term data-based perspective for the academic areas which will serve future college decision-making needs.

The second demonstration project opportunity grew out of the college's effort to design a computerized information system. During the systems analysis phase, it became obvious to many that the college did not have 1) a standard set of terms and definitions and 2) a clearly established and widely understood set of policies and procedures to facilitate activities and operations. Many people realized that this may have been alright when the college functioned on a manual information system, but that it could not work with a computer-based system.

The primary user group that had been involved in the systems analysis took on the task of identifying terms, proposing and discussing meanings, and eventually agreeing on standard definitions.

It was not always an easy process because it raised questions about why words were used as they were and about what impact a change in terminology would have. Such questions at times were threatening to people, as were proposed changes. We worked very hard to convey the notion that a change in terminology or definition could lead to an improvement in practice, but was not to be taken as an indication that what was used before was wrong.

Finally, after five months, a basic set of student-related definitions was approved, published in dictionary form, and implemented throughout the college. There is now a consciousness to utilize the new terms in reports, publications, and daily activities. It will take some time, but eventually the new words will become part of our natural language. In the meantime, plans have been made to standardize financial and personnel-related terms too.

A third demonstration project began early in 1979 as a result of the college's attempt to make precise enrollment projections for Fall, 1979. Projected student tuition income is the basis upon which the annual budget is built, so it is necessary to have realistic but conservative enrollment projections for the upcoming year before the annual budget allocation process can begin.

In previous years, the projections were based on assumptions about the future being a better, but conservative, continuation of the past. That is, we expected to get a little larger incoming group of new freshmen and transfer students, to attract a much larger group of part-time students, and to somewhat reduce attrition of continuing students.

In 1978, mostly because of the presence of some new staff, questions were raised about this rather broad approach to projecting enrollment. Historical admission and retention figures did not differentiate between degree and non-degree students, nor did they distinguish between day, evening, and weekend students. The newer staff was uncomfortable trying to make projections on such gross data and asked if there was anything I could suggest to improve their efforts. My answer was that they were doing the best they could this year with the data that was available, but, if they improved the data base, in future years they could refine their projections.

I worked with these people to design the elements to be included in a small, basic student data base. The data would be stored in a computer. With this, I could do general analyses of the student body and also could provide college staff with access to student information that they never before had had.

The concerned staff - potential users - specified the pieces of information they wanted to include in the data base and explained why. With the approval of the relevant Chief administrators of the college, I began to plan and implement this student data base.

Raw data on students enrolled in Fall, 1978 were gathered from the Admissions and Registrar's offices, placed on coding sheets, sent out for keypunching, and read into a commercial time-sharing computer. I used SPSS to perform crosstab analyses on the data, and then produced an Enrollment Profile report which provided summary level information about the student body.

This student data base has been updated every semester since last fall, and Enrollment Profiles and Attrition Reports are now regularly produced. Administrators at first regarded these as perhaps interesting, but essentially unimportant reports. As time goes on, however, they are realizing how useful a series of consistent, data-based reports can be when they need factual information about college operations or have special problems to solve.

The real test of the impact of this data base development will occur early next year when we sit down to make enrollment projections for Fall, 1980 There will be three semesters worth of usable data, but the real task will be to learn how to use the data to help make better decisions.

The most recent demonstration project has been the development of comprehensive financial planning at the college using EDUCOM's Financial Planning Model (EFPM). After an EFPM seminar the Chief Administrators in general, and the Chief Business Officer in particular,recognized how valuable EFPM would be to annual budget making and institutional financial planning at MMC.

The Chief Business Officer and I began to work on identifying elements to be used in the model. It took us a while to extract the appropriate base line data, and often we had no rational basis for establishing growth factors. But now, with the help of EFPM staff, the MMC model is running, and the Chief Administrators are learning how to effectively use the model in the budgeting and planning processes.

The Future of PME at Marymount Manhattan College. With the demonstration projects approach, PME development has been successful in the Marymount Manhattan environment. The approach has provided opportunities 1) to raise administrators' consciousness; 2) to begin building a consistent, accessible, and useful data base; 3) to give administrators experience in using data-based reports, which, in turn, has increased their understanding of what PME can be, and 4) to establish my own professional and personal credibility.

The most significant outcome of this developmental process is the change in attitude that has occured among members of the administrative staff. There is a growing appreciation of the benefits that accurate data and systematic management practices provide to college managers and decision makers. There is a growing interest in gathering objective data to assist policy development, and there is a wide recognition that the resources of the Planning, Management, and Evaluation office can be used in many ways throughout the institution. These are very healthy developments and will serve as the foundations upon which future PME enhancements will be built.

Additional impetus for ongoing PME development at Marymount Manhattan will come from two external forces. The first is the state-mandated institutional Planning Process which will take place during the first quarter of 1980. The second is the Middle States Association which will conduct an accreditation visit in 1982. The studies that have been made, the consistent historic data that has been accumulated, and the other demonstration projects that have been conducted will be used in both of these undertakings.

With the basic information already at hand, faculty and staff will be able to direct their planning and self-study energies toward more important questions about improving the quality of education which our students receive and assuring the future of the college.

The developments of the past eighteen months have set the stage for future PME growth at Marymount Manhattan. Administrative improvement will continue to be an institutional goal, and since the college now has some experience with what that means, the objectives defined to achieve the goal will be more relevant and attainable, and better understood within the whole college community. I am convinced that we have made significant headway and have a firm foundation from which to pursue additional planning, management and evaluation improvements.

Concluding Thoughts about the PME Evolution

McManis and Harvey (1978: 96) cite "Ten Reasons Why PME's Fail":

1. Organizational instability.
2. Refusal of managers to alter their administrative styles.
3. Refusal of top administrators to plan and delegate responsibility.
4. Lack of presidential support.
5. Failure to develop new skills, particularly objective-writing and quantification skills.
6. Failure to understand the system -- usually the initial system is too complex.
7. Lack of professionalism on the part of managers -- they fail to see themselves as "professional" managers.
8. Lack of time for implementation.
9. Expectations of the system are too high.

10. Individual evaluation is too closely tied to the initial implementation and becomes a highly emotional "tail that wags the dog".

I think that these reasons have a lot of validity. But, as professionals involved in actual PME development, I believe we need some positive guidelines about what to do when confronted with the kinds of administrative realities which McManis and Harvey identify. Therefore, I am offering the following "Ten Guidelines for PME Development in Small Colleges":

1. Understand the institution; this includes the educational philosophy, the personnel, the traditions, the operations and the politics.

2. Assess PME readiness; using your technical knowledge and practical experience, determine what kind of PME improvement the administration is ready for and begin there. There is nothing wrong with attempting to build a more accurate data base or to clarify current administrative procedures. In fact, these are essential first steps for future, more sophisticated PME developments.

3. Exercise initiative and leadership; a responsive operational style will be ineffective with staff who are not experienced with PME processes and cannot articulate PME needs.

4. Understand and remember the comprehensive PME model; the techniques and theories of PME do have much merit, and your goal should be to move your institution toward the PME ideal. Remembering the overall model will give direction and purpose to what may seem like isolated and insignificant improvements.

5. Foster an environment that is both supportive and challenging; people need to be assured that the way they have been operating is not wrong but, at the same time, they should be encouraged to suggest or attempt new approaches to planning, management, and evaluation.

6. Demonstrate what is possible; use your experience and technical skills to provide examples of the improvements that are possible.

7. Build or maintain a useful data base; insure that it is consistent, accurate, accessible, and relevant to decision-making needs.

8. Establish credibility; people must have confidence in your knowledge and technical competence.

9. Establish trust; people must have confidence in your personal integrity and political neutrality.

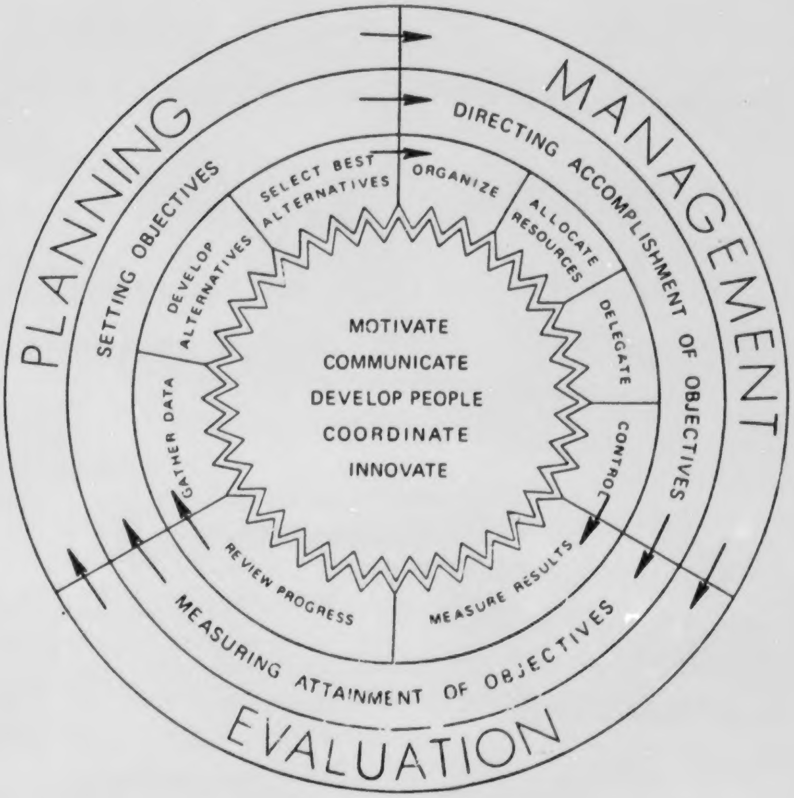
10. Be patient; evolution is a process which, in order to be successful, takes time. Give it time and PME will grow.

REFERENCE

Gerald L. McManis and L.James Harvey, Planning, Management, and Evaluation Systems in Higher Education, Ireland Educational Corporation, Publishers, 1978.

APPENDIX A

ELEMENTS OF A PLANNING, MANAGEMENT, AND EVALUATION SYSTEM


PLANNING
MANAGEMENT
EVALUATION
SETTING OBJECTIVES
DIRECTING ACCOMPLISHMENT OF OBJECTIVES
MEASURING ATTAINMENT OF OBJECTIVES
SELECT BEST ALTERNATIVES
ORGANIZE
ALLOCATE RESOURCES
DELEGATE
CONTROL
MEASURE RESULTS
REVIEW PROGRESS
GATHER DATA
DEVELOP ALTERNATIVES
MOTIVATE
COMMUNICATE
DEVELOP PEOPLE
COORDINATE
INNOVATE

(taken from McManis and Harvey, 1978:9)

D.C. Evancoe
11/79

APPENDIX B

PLANNING: a continuous and cyclical process through which an institution reaffirms its mission and establishes realistic goals and objectives.

KEY CONCEPTS FOR EFFECTIVE PLANNING

- IT IS AN ONGOING PROCESS: it is cyclical and fed by new input and by the results of the evaluation process.
- IT HAS A REALISTIC TIMETABLE: 1) it is synchronized with other institutional activities; 2) it is able to be accomplished within the time provided.
- IT IS COMPREHENSIVE: it encompasses all units of the institution.
- IT TAKES AN INTEGRATED APPROACH: it interrelates all units of the institution.

D.C. Evancoe
11/79

APPENDIX C

MANAGEMENT: the processes and techniques which people use to achieve the objectives outlined in the planning process.

KEY CONCEPTS FOR EFFECTIVE MANAGEMENT

- IT IS A PROCESS: it is based on agreed-upon procedures, techniques, sequencing, etc.

- IT IS FOCUSED: it is directed toward the articulated objectives developed during the Planning process.

- IT IS FEASIBLE: the institutional objectives are translated into activites or tasks for the various program units or staff members.

- IT IS UNDERSTOOD: policies, procedures, lines of reporting, and authority for decision-making are clearly documented, widely-known, and fully understood.

- IT IS UNIFORM: the agreed-upon and understood policies and procedures are consistently followed throughout the institution.

- IT IS SUPPORTED: executive and staff personnel provide ongoing support to operational managers.

D.C. Evancoe
11/79

APPENDIX D

EVALUATION: the process of gathering evidence of the performance of a group or a program in relation to the objectives that were specified in the planning process.

KEY CONCEPTS FOR EFFECTIVE EVALUATION

- IT IS A PROCESS: it assesses management outcomes in light of stated plans; the results feed into the next Planning cycle.
- IT IS OUTCOME-ORIENTED: it can focus on efficiency outcomes, or effectiveness outcomes, or both.
- IT IS FOCUSED: it is directed toward the articulated objectives developed during the Planning process.
- IT STRIVES TOWARD MEASUREMENT (OR COMPARISON): the measures may be quantitative or qualitative.
- IT IS COMPREHENSIVE: some form of evaluation activity is performed in every unit of the institution.

D.C. Evancoe
11/79

APPENDIX E

LISTING OF ITEMS FROM PME CHECKLIST (adapted from McManis and Harvey, 1978: 81-82)

Respondents are asked to check Yes, Being Developed, No, or Don't Know for each item.

PLANNING:

1. Does your institution have a clearly defined and systematic planning process?
2. Is it used in long-range planning (10 years or longer)?
3. Is it used in short-range planning (5 years or longer)?
4. Is it used in establishing a facilities and campus master plan?
5. Is it used in establishing a financial master plan?
6. Is it used in establishing an academic and program master plan?
7. Does your institution have a systematic process for setting and periodically reviewing institutional mission and goal statements?
8. Does your institution have a systematic process for routinely setting one and five-year institutional objectives?
9. Does your institution have a systematic process for setting one-year individual objectives for staff?

MANAGEMENT:

1. Do you have an effective system for communicating, delegating, coordinating, and evaluating managerial work?
2. Is the management process directly linked to the planning and evaluation processes so that there is no "slippage" or chance for "wasted effort"?
3. Is the decision-making process defined clearly and communicated effectively to all in the institution?
4. Are job responsibilities clearly defined, written, and regularly reviewed?
5. Is there a clearly defined governance structure identifying the roles of the Trustees, President, administration, faculty, staff, and students?
6. Is there a clearly defined process for developing the institutional budget?
7. Is there a professional development program for institutional managers, faculty, and staff?
8. Are there clearly delineated transactional information systems to support mid- and lower-level managers?
9. Is there a well-defined management information system to provide information to top-level decision makers?
10. Is there a well-developed and understood functional plan for evaluating individual managerial effectiveness?

EVALUATION:

1. Is there a systematic and routine plan and process to evaluate institutional effectiveness which is linked to goals and objectives?
2. Is there a clearly defined list of institutional outcomes linked to the institutional objectives?
3. Are there regular follow-up studies of graduates and "early leavers"?
4. Does a statement containing suggestions for improved management procedures accompany your annual financial audit?
5. Do you have a system for obtaining independent and external program audits (every 3-5 years) on major college programs?
6. Is evaluative information linked to the institutional MIS and routinely fed back to institutional planners?

D.C. Evancoe
11/79

APPENDIX F

PME DEMONSTRATION PROJECTS
at Marymount Manhattan College
(April,1978 - November,1979)

1. Research on curriculum and academic organization
    - courses taken by 1978 graduating class
    - curricular offerings during the past three years
    - degrees conferred by subject area since 1972
    - distribution of student grades
    - analysis of faculty instructional workload since 1974

2. Development of standard terminology and definitions

3. Computerization of basic student data
    - semesterly enrollment profiles
    - semesterly attrition reports
    - special studies

4. EDUCOM Financial Planning Model

D.C. Evancoe
11/79

MBO AND PLANNING IN THE SMALL COLLEGE:
PERSONNEL, PROGRAMS AND BUDGETING

Paul Corts
and
John R. Prince, Jr.
Oklahoma Baptist University

In a small college setting the application of MBO concepts for planning and management purposes have been used in the following three areas: Personnel, Programs, and Budget.

The interrelationship of these three areas are discussed using forms, charts, graphs and other references. The aim of this paper is to explain the procedure and to show what was done so that the reader can better extract what must be done to set the processes in operation under other circumstances.

Management by Objectives and Planning in the Small College:
Personnel, Programs and Budgeting

By

Paul R. Corts
and
John R. Prince
of
Oklahoma Baptist University

Over the past decade MBO has become an "in vogue" term which many in higher education have used easily without taking the hard, tough actions necessary to really implement the concept. MBO - Management by Objectives - is a term we have adopted in higher education from its original use in the business world. In the early '70's, when the enrollment boom tapered off and we all began to look around to see how we could survive in a more static environment, we found this catchy self-describing phrase to offer quite a panacea. Indeed, for those institutions where the concept was put into rigorous practice, it has performed some amazing wonders.

Almost any issue of The Chronicle will have advertisements alluring institutions to participate in a conference or hire a consulting firm which can help you initiate MBO on your campus. I have talked to a variety of administrators from quite a pot pourri of institutional types and state governing agencies where MBO in some form has been adopted and with good success.

Sixteen months ago I left a medium sized state university of about 14,000 to take up a newly created post at a small--1600-- student, privately supported church-related institution. Although quite a number of management improvements were getting underway, we have made rather giant strides these last 16 months. What you will hear today is a case story of how some of the basic concepts in MBO have been put to work at a small institution to produce extremely positive results. Within one year, the application of MBO concepts established a solid "in the black" budget--as versus a previous budget with a $150,000 in red which had to be trimmed in the middle of the year; reduced approximately 10-12 personnel positions at a savings of approximately $150,000; provided a 10 percent wage increase; put sorely needed money back into operating programs; and began to cope with the problems of deferred maintenance which had cropped up in the pre-MBO years.

We applied basic MBO principles to three specific areas:

PERSONNEL

Whereas pre-MBO, personnel seemed to increase regardless of enrollment or other factors--it was a monster out of control. Everyone always needs more staff--and without a clearly stated list of objectives developed by management and pinpointed to staff resources, the area had grown all out of proportion. Though there had been a four year trend of slight decline in enrollment before a levelling off this year, faculty and staff continued to increase in numbers. The application of MBO principles asks some tough, hard questions about Who is doing What with What Productivity.

PROGRAM

In pre-MBO years, new programs were added without full analysis of economic impact. For example, one new program was begun with a new high priced "endowed" professorship--the catch is that no one ever put up the money to endow the professorship and yet the new high priced faculty was added. The application of MBO to programming forces answers to What, Why, When, etc.

BUDGETING

In pre-MBO years, each fall the institution went through an agonizing and demoralizing process of adjusting the budget downward in the middle of the year after actual income came into clear view. For example, after classes started in Fall '78 the institution had to cut more than $150,000 out of an already approved budget--and these cuts are made with no planning but rather in the areas of least resistance, certainly not the most productive way to manage a budget. The application of MBO principles forces realism in projecting income and expenditures and analyzes how much should be spent where to meet institutional goals.

Before going any further I would like to provide a brief historical sketch of OBU to set the stage for the action we undertook in personnel, programming and budgeting. Oklahoma Baptist University is a private, church-related, four year university of approximately 1600 students located at Shawnee 30 miles east of Oklahoma City in central Oklahoma. In 1971 the University purchased an IBM 1130 computer system with a disk drive capacity. In September of that year a new president assumed office. One of his initial actions was to hire a consultant to review the management organizational structure. In 1972, using the consultant's recommendations, the basic organization was established with the president and 5 vice presidents (Administration, Academic Affairs, Student Affairs, Business Affairs and Development). In 1973 the Vice President for Administration began actions to apply for an Exxon Foundation Grant under the Resources Allocation Management Program (RAMP). The purpose of the grant was to assist the University in applying MBO principles in the operation of the University. The grant was submitted in June 1975 and approval was received in February 1977. In the intervening period the president left the university in September 1976 and a new president assumed his duties in October 1977. Two events occurred which moved the personnel, programming and budgeting areas of OBU forward at a different pace and with a new emphasis. First there was a change in the organizational structure. The University is structured into two major divisions under the President. The Provost with all academic functions and the Executive Vice President with all administrative and support functions. This reorganization also placed major emphasis on improved management information flow and control as well as broadening the role of computer use throughout the University. The former emphasis has lead to an improved personnel system which I will be speaking of and the latter has resulted in an upgrading and expanded use of the computer in the academic and management areas of the University.

A Hewlett-Packard 3000 system with 8 terminals was purchased in August 1979. The system has the capacity of terminal expansion to 16 without any added modidications, and easily to 32. Not only will the computer be used in the Business Office accounting functions, but also in the personnel, registration, Development, Alumni and Admissions areas and will extend into class room academic areas of instruction. Conversion is now underway to shift and upgrade the IBM 1130 programs to the HP 3000 plus expand the management, budget planning and personnel functions through use of increased computer capabilities.

During this period OBU began to define the internal organizational structure down to and including each individual position. At the same time the president appointed and chaired a committee composed of faculty, staff, alumni, trustees and student representatives to restate the purpose of the university and to define specific university goals. This committee met over a period of 15 months in lengthy sessions prior to finalizing a purpose statement and specific goals which they felt would be adequate for the University. In December 1975 the Board of Trustees approved this committee's recommendations. With these two key foundation stones in place the expansion of these goals into supporting goals and objectives down to the department level began. Along with this emphasis came the increased support and emphasis of the new president. At this point the detailed development of a university personnel system began to rapidly develop.

The first task that we found had to be established was exactly what do we have each employee doing. How is the organization actually functioning? We found that a job analysis survey where each employee puts on paper exactly what they did, how they do it, what equipment they use, would best accomplish that task. A "Job Questionnaire" was prepared and each employee filled out the form relating to their individual position. The emphasis was placed on the employee stating what they actually do, not what they thought they were supposed to do. A series of three (3) four (4) hour workshops were conducted to assist the employees in this effort. By staggering these workshops we were able to get a majority of the employees in one of the sessions. The total time from the first workshop until the final job questionnaire is returned was just under

4 weeks. We recommend that a specific staff member be assigned the task of assisting the employees and checking on the status of all questionnaires. One final step in the completion of these questionnaires is the supervisor's review and comment. This step is to allow another knowledgable person to review the position before any further use is made of the results.

Having these job questionnaires as the source documents, job descriptions were written. At OBU the Personnel Services Office undertook this task. This was done for several reasons. First it relieved the various departments of a large typing workload and, in turn, a big objection that many would have to supporting the task. Next, it insures a greater degree of uniformity in the wording and completeness of the various job descriptions.

The first rewrite was done as a draft and coordinated with the supervisor and, whenever possible, with the employee. After receiving their comments, the job descriptions were finalized, signed by the supervisor and dated. A sample form is included as Incl. 1.

In the upper right of the form there is a block "2A. Position No." The next step was to prepare a Personnel Registry with a numbering system to identify each position by individual by department by major organizational element. One requirement that OBU used was not to "reinvent the wheel" but try to incorporate as much of our existing system data as possible. We had a budget accounting code which I will discuss later. That code became the cornerstone of our Personnel Registry numbering code. In the budget accounting system each department is identified with a three (3) digit code. We began from the top - the major organizational element and worked down. A copy of the total code structure is included as Incl. 2. The President is #1, Provost is #2, and Executive Vice President is #3. Next is the major subdivision. For example: the College of Arts and Sciences under the Provost. Already having a code (3 digit) for the departments, the English department is #408. Then comes the individual positions which are approved for that department. The Chairman is #01 with the other approved faculty 02, 03, 04. If a secretary or other employee is approved for that department their registry number would be included. By using this system each individual approved position can be identified by this eight (8) digit code.

On our campus we have some employees who work at OBU but are paid by other agencies or from grant or other type funds. It is helpful to be able to identify the positions. So the system was expanded by one space. For employees who work at OBU but are paid by another agency, we use the letter "A" in conjunction with the individual two (2) digit number "02". If that employee were working at OBU but paid by grant or some other fund we use the letter "B".

If you wanted further detail in your system you can easily add numbers to the end of this nine digit code. However, a point I wish to stress is that careful consideration and review must be given to the overall purpose and intended use of the Personnel Registry before you start and before you make the system too large. Your computer capability and existing and planned programs must be closely coordinated in this effort.

Having identified the duties of each approved position and how to identify each position the next task was to develop a classification system for all positions to be followed by a pay rating system. The first step was to place all positions in a specific category. Notice I am dealing with "Positions" not personalities. At OBU we listed all employee positions by category. A detailed listing is attached as Incl. 3. We have four (4) major groupings with subgroupings under each group. Since OBU is a private, church-related institution, not having to respond to the volume of state legislative committees and commissions, we feel that these groupings fit our needs. Each of you must review your reporting requirements, regulations, and internal needs then develop your classification system to fit these requirements. We offer this as one way to do the task. It fits OBU's needs.

Pay ranges and pay scales are another individualized task which must be developed to fit your location and the market conditions of your regional area. In the OBU job market area, conditions have become quite unsettled with a major General Motors assembly plant opening 30 miles away as well as about seven (7) major industries moving into Shawnee in the past three (3) years. Wages of three years ago, increased to meet just inflation, do not adequately attract the quality of employee desired due to this industrialization impact. So a firm wage policy for the University had to be established. Questions such as the following had to be answered:

A. What does the University want to pay for performance, commitment, experience/education and living cost?

B. What is the University willing to pay if it wants to be the area wage leader, if it wants to meet the local or national market, or if it is going to just follow the market?

While this policy was being decided, the previously developed job descriptions were grouped into the general classifications. A baseline job was selected for each category. At this time a proposed pay range by category and grade level for hourly employees of the University based on our final wage policy has been submitted to the University Personnel Committee for their recommendations to the President. When implementing such a system for the first time, with pay being centrally controlled, you find employees overpaid, underpaid and all through the ranges. We have found this to be true at OBU. In our 1979-80 budget we began to make adjustments to correct this imbalance. Over the next year or two, we hope to continue to upgrade the financial support necessary to complete the adjustments to rectify any gross inequities.

Having defined all approved positions as to qualifications and duties required by job descriptions, identified each on a Personnel Registry, completed a classification system and developed pay ranges, the personnel system became a valuable tool in hiring, position evaluation and control of the major expense item of any university budget.

The second area of this presentation deals with programs and program changes. As stated earlier a clear statement of purpose with concise goals and definitive, measurable objectives is the foundation to developing the planning and programs for any institution. The key to the successful building on this foundation is full support of your chief executive officer and senior administrators. With their active support the department level supervisors develop their goals and objectives to support the university goals and objectives.

Long range planning for programs and other projects should be actively stressed through the next five (5) year time frame. I realize that with the state of the economy and other factors many people state only 2 to 3 years future planning is possible. However many changes, adjustments and construction projects require a minimum of five (5) years. Therefore planning on a broad scale should preview the next five years with more specific details being brought into sharper focus at the three (3) year stage.

In the process of developing specific goals and objectives for the academic area of the University, we developed a long-range academic planning form in the spring of 1979. Data on graduation by discipline, number of students enrolled by year, by class, by discipline and demographic data (national and state), projected population trends, and other information was sent along with this form to each academic department chairman. Next a workshop was conducted to explain and assist the chairmen in what was the purpose of the long range planning and how to use the planning form and data. Again the workshop was repeated three times in two days to insure that all chairmen could attend. The chairmen returned to their departments and conducted planning sessions with the members of their department. In October 1979 the planning workshop was repeated to review input from the spring session and project the planning through the coming five years. Special emphasis was placed on the 1980-81 budget year and the 1981-82 year.

The key elements are: Demand - exactly what has been the past trend for this program? What are the future expectations for the program?

Second - What is the capability of the university to offer this program?

Third - What will be the personnel implications as to faculty and support staff personnel?

Fourth - What will be the space requirements? Will new labs, classroom arrangements or other modifications be required?

Fifth - What equipment and supplies will be required? Will these items have to be purchased, transferred from another area or can current items be used in place?

Input from the departments will be consolidated by college, reviewed and commented on by the Dean and forwarded to the Provost. The entire University will be reviewed at that point. The President, Provost and Executive Vice President will review the entire planning document in light of the overall University, how the academic programs will impact support programs and planning and other long range activities. The entire program will then be assembled into the University long range planning program for the coming five (5) years. Each year the program will be reviewed and updated. As I have stated earlier, the first two or three years will be in much greater detail than the last two. However our goal is to also be looking forward in some depth for at least five years.

Thus far we have the personnel well in hand and we are down the road on planning and programming. The third area of this presentation is budget consideration. We are all aware that no matter how well we plan our programs and project our personnel needs the controlling factor is what will the budget of the University support? If a program is to be added how can the income be obtained to pay for the added expense? Or how can the expenses in other areas be trimmed to pay for the program changes required?

Much of the budget work at OBU has been done by brute force calculations in the past. In 1973-74 a revised account classification code was installed on our IBM 1130 computer to provide more detailed monthly budget printouts to all departments. A seven digit code was used which allows 3 digits for department identification; one digit for income or expense identity and 3 digits for the object code identity of the specific income source or expense allocations. Initially we made the major divisions correspond to the major organizational elements of the campus. We have used this coding system since June 1975. Thus far it has been very flexible and served our needs quite adequately.

As of this date we have not developed any computer or other automated program to aid in budget projections for "What if" type situations. I am referring to what if tuition increases 5%; what if inflation continues at a 10% rate; what if room fees increase 5%; what if enrollment remains constant; and other such variables. In the past this has been done manually. However by use of trend data, and careful input planning from all segments of the campus we have done reasonably well. In 78-79 we had to do a mid-year budget adjustment due to over optimistic enrollment estimates. In planning for the current year we expanded our budget hearing during December 1978 and January 1979 to include greater long range emphasis while increasing our efforts on the 79-80 year. Thus far our projections for 79-80 have been much better and we feel we will be within ½ of 1% at the close of the year.

The next major requirement is the development of a budget planning cycle to clearly outline the actions to be taken and at what time each will start and when it must be completed. As one budget year draws to a close in June and July we begin to review that year, re-evaluate the year which will begin in August and start detail planning for the following year. Income projection is the first phase. Having analyzed past income sources of endowment, gifts, convention appropriations, tuition, fees, room and board charges, a general income bracket is established. Initial planning guidance is developed within the Planning Analysis Committee (President, Chief Administrators, Faculty, Alumni, Trustees and Student Representatives) and submitted to each department chairman. During October and November the departments prepare their requests. These are reviewed up the chain of command of the organization and consolidated by the budget assistant (Director of Institutional Planning & Personnel Services). In December and January the Executive Vice President, as the University Budget Officer, with the Provost for the academic departments and the Budget Assistant will hold budget request reviews with each department chairman. A final summarized budget is then submitted to the President for his approval prior to Board of Trustees approval during their annual budget meeting the last week in February. Final line item budgets for each department are given to each chairman not later than mid-May. This allows the rest of May, June and July for the departments to prepare for the coming academic year with an approved budget.

As you are all aware institutions of higher education budgets are heavily influenced by personnel salary and benefits. Their inability to do much to improve productivity in such an atmosphere increases the requirement for greater stress on all forms of planning. Every effort must be made in budget operation to seek ways of increasing the effectiveness of even the smallest program or operation. Actions to reduce personnel turnover, manpower and utilities saving devices, workload consolidation, and some nice-to-have activities must be carefully considered and planned in detail for both the short and long range time period. Budget planning must begin early, be a continuing process and look to the future for at least 5 years.

CONCLUSION

The application of MBO principles in small institutions is particularly tough, but as I hope you have seen it can be successful and thus rewarding. MBO requires:

1. Management as distinguished from administration. Let me tell you how I sharpen the focus to contract these two terms: Management is aggressive--Administration is passive; Management requires application of business-for-profit type principles--Administration implies bureaucratic not-for-profit principles; Management will likely ruffle some feathers--Administration tries to passify as many constituencies as possible; Management makes a concept work or quickly shifts--Administration tries to make it work and is slow to shift if it doesn't work.
2. Objectification of our task. Higher education has been prone to say--and I hear faculty colleague voices in my ears as I say this to you right now--that we can't quantify or objectify our task. Crossing this hurdle to help the higher education community understand that most of our tasks can be quantified and measured is a heroic accomplishment.

3. The Small College Setting. As I mentioned, I feel MBO is particularly tough to apply in the small college setting. We are prone to think of our institution in an idyllic sense as a great bastion of knowledge where faculty tutors educate young minds. In such a world, there is _no_ place for _management_--and precious little place for administration. The colleagial relationships, the feeling of community, the close personal relationships that bind all of the university community together make it tough, very tough, to bring along the change in thinking which is usually required if MBO is to operate.

OKLAHOMA BAPTIST UNIVERSITY
DESCRIPTION OF POSITION

1. Department or Location	2. Position Title		2A. Position No.
	3. Classification	4. Classified by	5. Date

6. DUTIES/RESPONSIBILITIES

I. INTRODUCTION:

II. DUTIES AND RESPONSIBILITIES:

7. Certified by:		8. Reaudit certification				
Signature of Supervisor	Date	Date				
		Supervisor				
		Classifier				

OBU Personnel Form 1
July 1978

III. Supervision:
Received:

Given:

IV. Qualifications:
Education
Required:

Preferred:

Experience
Required:

Preferred:

Equipment
Required:

Preferred:

Physical Condition
Required:

Preferred:

Others

Substitution for above requirements must have prior approval of Department Director and Director of Personnel.

V. Other Job Information: (specific assignment area, unusual conditions or requirements)

Note: Attach added page for any item where additional space is required.

oklahoma
baptist
university
ob

Personnel Registry
Code

Digit 1: Major Organizational Level

1 - Presidential Area of Responsibility
2 - Provost Area of Responsibility
3 - Executive Vice Presidential Area of Responsibility

Digit 2 & 3: Second Organizational Level

00 thru 09 - 01 = Presidential
10 thru 29 - 10 = Provost
12 = College of Arts and Sciences
15 = College of Fine Arts
20 = Faculty Development
25 = Academic Support Programs
30 thru 69 - 30 = Executive Vice President
33 = Vice President for Student Development
40 = Vice President for Business Affairs
45 = Development
46 = Planned Giving
47 = Public Relations
49 = Alumni
51 = Placement
53 = Registrar
56 = Computer Center
58 = Admissions
60 = Institutional & Budget Planning
63 = Personnel Services Office (if required)
65 = Assembly (if required)

Digit 4, 5, and 6: Departmental Area

The approved account numbers used in department budget will be used for these three digits, i.e., Office of President - 205; English Department - 408; Office of Dean of Fine Arts - 505.

Digit 7 and 8: Personnel Register Number

01-99 - Each approved space in each department will be numbered, i.e., Department Chairman and Professor-Biology - 01; Assoc Prof-Biology - 02; Asst Prof-Biology - 03; Secretary - 04.

Digit 9: Special Category Personnel

A = Work at OBU but paid by other agency.
B = Work at OBU but paid by grant or other funds.

Category of Employees

I. Faculty - A. Professor
    B. Associate Professor
    C. Assistant Professor
    D. Instructors
    E. Lecturers
    F. Assistant/Consultant
    G. Other (Librarian Ass't)

II. Exempt - A. Executive
        1. President
        2. Executive Vice President
        3. Provost
        4. Vice Presidents

    B. Administrative
        1. Deans
        2. Directors
        3. Associate/Assistant Dean
        4. Others

    C. Professional/Non-Faculty
        1. Counselors
        2. Other

III. Non-Exempt - A. Salary
        1. Managers
        2. Supervisors
        3. Para-professional

    B. Hourly
        1. Supervisors/Foremen
        2. Secretarial - Clerk
        3. Skilled Craftsmen
        4. Custodial
        5. Safety

IV. Students

Computer Enhanced Academic Alert and Advisement System

Dr. J. Terence Kelly
Vice President for Education
Miami-Dade Community College
11011 S.W. 104th Street
Miami, Florida 33176

Dr. Kamala Anandam
Director
Computer-based Instructional Development and Research
Miami-Dade Community College
11011 S.W. 104th Street
Miami, Florida 33176

1979 CAUSE National Conference

November 27-30, 1979

Orlando, Florida

Background Information

Miami-Dade Community College started in 1960 in temporary facilities with approximately one thousand students. Today the College has four campuses, offers educational programs in some two hundred other sites in the greater Miami area, has developed an extensive home-based program through the use of radio and television, and has a credit enrollment in excess of 43,000 and a total enrollment of some 58,000 students. Over the years the College has earned a national reputation for exemplifying quality in the community colleges.

During the 1960's historians cited Miami-Dade as having the fastest growth rate of all American institutions of higher education. While the rate of growth of Miami-Dade has been phenomenal in terms of the number of students and faculty and the design of new facilities, the success story of Miami-Dade can be attributed to five essential factors: (1) the variety of educational programs; (2) the quality of the faculty; (3) the magnificent educational facilities; (4) the imaginative ways of administration; and (5) the long-term successes of the students.

Several years ago the Department of Health, Education, and Welfare selected what they described as the most outstanding colleges in the country for an in-depth study. As part of that study, they posed the obvious question to our College President, Dr. Peter Masiko, Jr., who has been with Miami-Dade for eighteen of its twenty years, "Why has Miami-Dade achieved such a phenomenal explosion of educational services and reputation?" His answer was, "We had at least some of the right answers at the right time."

While it is clear that the College had some of the right answers in the 1960's and 70's, it is equally evident that those institutional responses are not appropriate for Miami-Dade Community College in the 1980's. Because of our fundamental realization that the 1980's require new directions and a different thrust in the administration of "equal access/equal opportunity" in order to keep the College's open-door policy in effect, Miami-Dade has set forth a massive institutional change. The college's Executive Vice President, Dr. Robert H. McCabe, refers to the seven-year plan as a reformation of the college.

At the heart of Miami-Dade's reformation is a thorough review and revision of the General Education program, described fully in a book entitled General Education In A Changing Society. The rationale for the changes and a detailed description of the proposed program and related educational support services are presented fully in this book. An integral part of the changing academic environment at Miami-Dade has been the implementation of a new set of Standards of Academic Progress. (See Appendix A for details of the new Standards of Academic Progress.) These new standards have had a dramatic impact on Miami-Dade. Since their implementation in Fall Term, 1978, the College has suspended 3,410 students for lack of sufficient academic performance. At the time of implementing the new standards, the College made a firm commitment to provide better services to its students and thus prevent suspension.

J.D. Lukenbill and R.H. McCabe, General Education in a Changing Society, Kendall/Hunt Publishing Company, 1978.

It is clear to the administration of Miami-Dade that the current problems of education in the community colleges in Florida are caused by several factors, namely: (1) a growing public dissatisfaction with education at all levels; (2) a genuine concern about the basic skills of students; (3) the continued emphasis on equal access and equal opportunity; (4) other surging social needs in competition with education for dollars; (5) the continual lack of student performance as measured by the SAT scores; and (6) shrinking resources and a host of other related problems. Under these circumstances, it has become apparent that drastic changes are needed, if there is to be any real promise for breaking through in the area of productivity of learning. These drastic changes revolve around more care and precision in bringing students into the institution, advising them early in their academic career about their progress, providing the appropriate help for those students who are having difficulty, and prescribing acceleration programs for those students who could benefit from them. What is in effect at the institution is an entirely new "student flow" as shown in Appendix B.

Miami-Dade looked at its own resources and determined that, given the existing resources and the prospect of no new state resources forthcoming, there was no way possible to achieve the goals of better advisement and, in the end, a better education for its students unless creative applications of computer technology could be developed. Harnessing all the human resources--ideas, commitment, and teamwork--available at the college, the institution has developed two massive computer-based advisement systems that operate on the existing computer facilities. These two advisement systems are: (1) Academic Alert and Advisement System, and (2) Advisement and Graduation Information System.

This paper describes the preventive measure available in the Academic Alert and Advisement System, which uses a powerful and sophisticated system called RSVP (Response System with Variable Prescriptions), to provide students with information about their progress in courses earlier than the end-of-term grades. The applications of RSVP are generally in the instructional area. It is a flexible instructional system that is applicable to any course at any level and is essentially "faculty programmed." The faculty shape the direction and the role of the system. It is not an interactive system in the sense that there is no one-on-one interaction between the students and the computer. In most applications, neither the faculty members nor the students ever see a piece of computer equipment. In 1978, RSVP was used for the Academic Alert and Advisement System for dealing with a large number of students on an individual basis.

RSVP Computer System

RSVP (Response System with Variable Prescriptions) is a computer system that operates on an IBM 370-155 with the operational system OS. Being "content" and "context" free, RSVP can be programmed to provide individualized feedback in the print mode, customarily referred to as an RSVP letter. Since 1970, RSVP has been used for individualized instruction in basic skills programs (reading, writing, and mathematics), on-campus courses, and television and radio courses offered to distant learners. Since the RSVP system can be user programmed, each application of RSVP is unique in fulfilling the goals of the faculty and the needs of the students. In 1978, the use of RSVP was expanded to include advisement.

Design for the RSVP Academic Alert and Advisement System

At the first level of drawing up the design, the sources of student data for the RSVP Academic Alert and Advisement were delineated. These included: 1) student data base consisting of student characteristics and course and transcript information, 2) student test scores on reading and mathematics, and 3) information about student performance and attendance halfway into the term. The design as conceptualized at this level is illustrated in Figure 1. While a computer record system already existed for student data base and test scores, the methods of collecting information on the faculty's midterm evaluations of students' performance and attendance was developed specially for this program.

At the second level of drawing up the design, the relevant student attribute and course information from the student data base were identified. These included:

Age
Native language
Visa status
Scholar's grant
Financial aid status
Veteran's benefit status
Enrollment status
Advisement status
Type of Courses

ACADEMIC ALERT AND ADVISEMENT SYSTEM

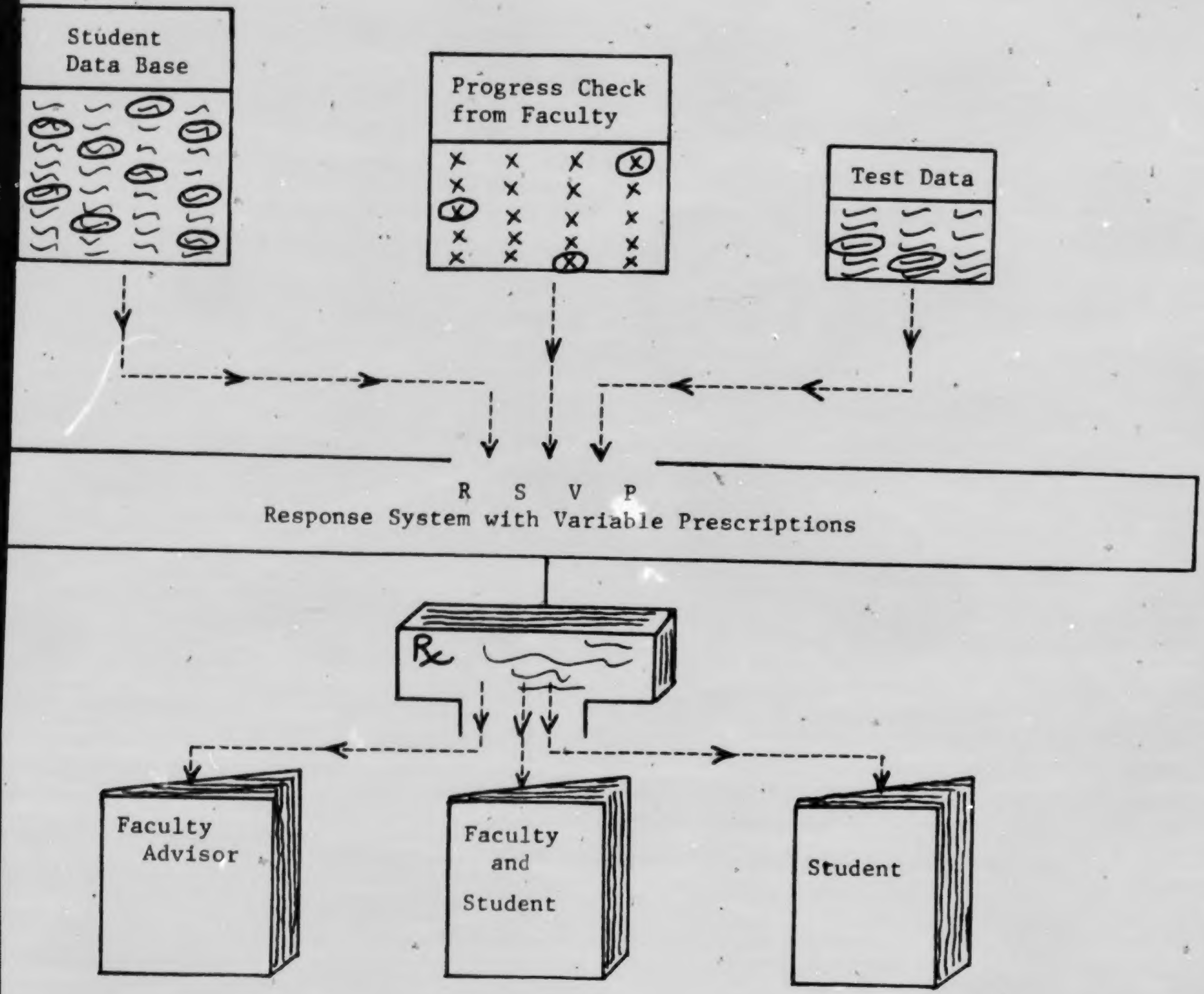

Student Data Base
Progress Check from Faculty
Test Data
R S V P
Response System with Variable Prescriptions
Rx
Faculty Advisor
Faculty and Student
Student

Figure 1

Number of courses registered

Number of courses dropped

Number of credits registered

Number of credits dropped

Cumulative grade point average

Cumulative hours registered

Cumulative hours attempted

Cumulative hours dropped

Cumulative hours earned

Standard of Academic Progress status

Previous term enrollment

Previous term performance

At the third level, the selected pieces of student attribute and course information were combined in a manner to form meaningful groups of students for variable feedback statements. Charts 1-7 on the following pages illustrate the formation of these groups. Charts 1-3 pertain to the new students (first-time-in-college and transfer students) and Charts 4-7 apply to the continuing students. Each chart includes two parts: (a) the primary feedback statements written, for example, for groups A-N in Chart 1 and (b) the secondary feedback statements written, for example, for additional considerations 1-4 in Chart 1.

Chart 1

Report on Progress

Students: New Students at Miami-Dade

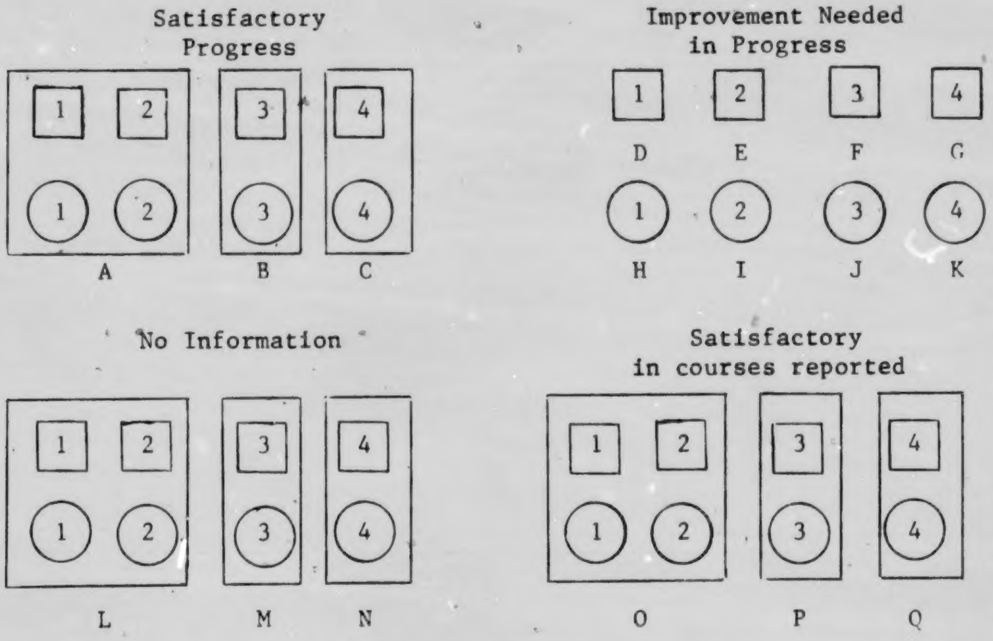
Factors Considered for Variable Feedback:

Faculty Evaluation . . . Satisfactory (all courses), Improvement Needed (in one or more courses), No information for any course, Satisfactory in courses reported

Course Load . . . . 12 or more credits = ☐ less than 12 credits = ○

Reading Score . . . . . . High = 1, Medium = 2, Low = 3, No information = 4

Groups Formed (A-Q) as shown below (excluding credit by exam, life-experience, community extension, Fire Science, and Open College courses):


Satisfactory Progress
1
2
3
4
1
2
3
4
A
B
C
Improvement Needed in Progress
1
2
3
4
D
E
F
G
1
2
3
4
H
I
J
K
No Information
1
2
3
4
1
2
3
4
L
M
N
Satisfactory in courses reported
1
2
3
4
1
2
3
4
O
P
Q

Additional Considerations for Variable Feedback on Progress:

(1) Poor attendance reported by faculty in one or more courses (Groups A-Q)

(2) Receiving veteran's benefits (Groups D-K)

(3) Credit by exam, life-experience, community extension, Fire Science, Open College courses, or any combination to indicate that those courses are excluded from the progress report

(4) Receiving financial aid (Group D-K)

Chart 2

Advisement for Future Registration

Students: 1) First-time-in-college students
2) Transfer students who are not under SOAP*

Factors Considered for Variable Feedback:

Program Code . . . . Decided (Program Codes not included in the Undecided or in Non-degree), Undecided (Program Codes 00, PC, AS), Non-degree (98, Z5-Z8)

Withdrawal Since 100% Refund . . . . . Withdrawn one or more courses but not all = ☐
No withdrawals = ○

Advisor Code . . . . Faculty/Department Advisor = 1, Self-advised or no information = 2

Groups Formed (A-L) as shown below:

Decided		Undecided		Non-degree	
$\boxed{1}$	$\boxed{2}$	$\boxed{1}$	$\boxed{2}$	$\boxed{1}$	$\boxed{2}$
A	B	E	F	I	J
①	②	①	②	①	②
C	D	G	H	K	L

Additional Considerations for Variable Feedback for Advisement:

(1) All courses taken off-campus (Groups A-L)

(2) English is non-native language (Groups B, D, F, H, J, L)

(3) Open College courses

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*Academic Standing is satisfactory under the Standards of Academic Progress

Chart 3

Advisement for Future Registration

Students: Transfer students who are under SOAP*

Factors Considered for Variable Feedback:

Withdrawal	Withdrawals since 100% refund, No withdrawals since 100% refund
Standards of Academic Progress (SOAP) categories	Warning (Registered 7-16 credits, GPA less than 1.5)
	Probation - Withdrawal (Earned credit in less than half of 17-29 credits registered)
	Probation - GPA (Attempted 17-29 credits with less than 1.5 GPA)
	Suspension - Withdrawal (Earned credit in less than half of 30 or more credits registered)
	Suspension - GPA (Attempted 30 or more credits with less than 1.5 GPA)

Groups Formed (A-J) as shown below:

Withdrawals since 100% Refund	No Withdrawals since 100% refund
Group A = Warning	Group F = Warning
Group B = Probation-Withdrawal	Group G = Probation-Withdrawal
Group C = Probation - GPA	Group H = Probation - GPA
Group D = Suspension-Withdrawal	Group I = Suspension-Withdrawal
Group E = Suspension - GPA	Group J = Suspension - GPA

Additional Considerations for Variable Feedback for Advisement:

(1) All courses taken off campus (Groups A-J)

(2) Currently registered courses are in excess of credit limitation (Groups A-E)

(3) Currently registered courses are in excess of credit limitation (Groups F-J)

---

*Academic Standing is not satisfactory under the Standards of Academic Progress

Chart 4

Report on Previous Term Status

Students: Continuing and Non-continuing Students from Previous Term(s)

Factors Considered for Variable Feedback:

Cumulative GPA including Academic Standing category

Super (GPA 3.50-4.00) = 1
Okay (GPA 2.00-3.49) = 2
Danger Zone (GPA 0.00-1.99) = 3
Warning = 4
Probation - Withdrawal = 5
Probation - GPA = 6
Suspension - Withdrawal = 7
Suspension - GPA = 8
Extended Probation = 9
Extended Probation = 10
Dismissal after readmission = 11
Approved Appeal after suspension = 12
Approved Appeal after dismissal = 13
Registered Special Summer Course = 14
Graduated = 15

Continuing *without* a break *previous* major term

1 = A
2 = B
3 = C
4 = D
5 = E
6 = F
9 = G
10 = H
12 = I
13 = J
14 = K

Continuing *after* a break in *previous* major term

By Student Choice

1 = L
2 = M
3 = N
4 = O
5 = P
6 = Q
9 = R
10 = S
12 = T
13 = U
14 = V

For Academic Standing Requirement

7 = W
8 = X

Non-continuing *after* being active *previous* major term

By Student Choice

1, 2 = 1
3 = 2
4, 5, 6 = 3
9, 10 = 4
12, 13 = 5
14 = 6
15 = 7

For Academic Standing Requirement

7, 8 = 8
11 = 9

Additional Considerations for Variable Feedback:

(1) Receiving Veteran's Benefits (Groups D-K and O-X)

(2) Cumulative Credits Earned 30 or more (Groups 1-6)

Chart 5

Progress in Current Term

Students: Continuing Students

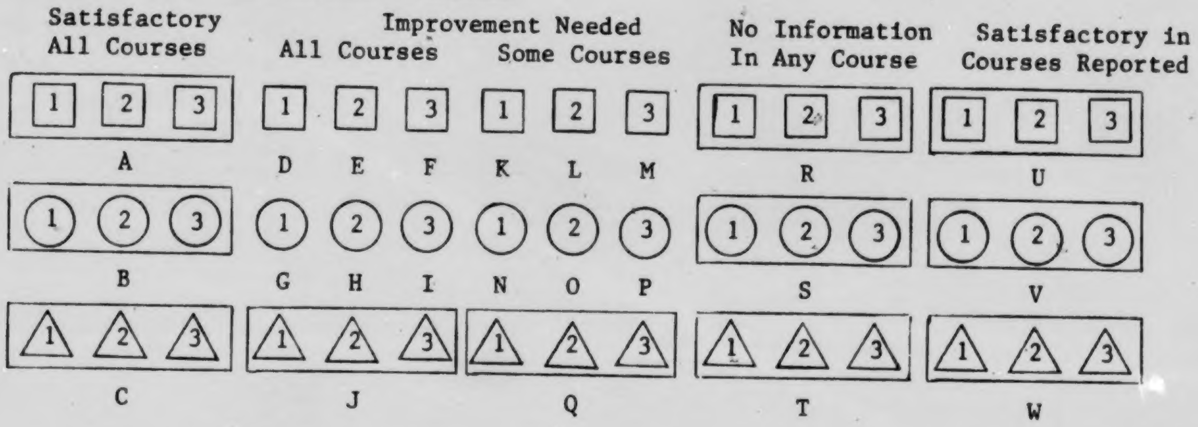
Factors Considered for Variable Feedback:

Progress: Satisfactory in all courses, Improvement Needed in all courses, Improvement Needed in some courses, No information for any course, Satisfactory in courses reported

Attendance: Satisfactory in all courses = □ , Needs improvement in one or more courses = ○ , Partial or no information on attendance = △

Hours Registered: 1-3 credits = 1, 4-11 credits = 2, 12 or more credits = 3

Groups Formed (A-W) as shown below:


Satisfactory All Courses
Improvement Needed
All Courses
Some Courses
No Information In Any Course
Satisfactory in Courses Reported
1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3
A D E F K L M R U
1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3
B G H I N O P S V
1 2 3 1 2 3 1 2 3 1 2 3 1 2 3
C J Q T W

Additional Considerations for Messages for Variable Feedback on Progress:

(1) Withdrawn since 100% refund (Groups A-W)
(2) International student taking less than 12 credits and not under SOAP
(3) English is non-native language (Groups D-T)
(4) Credit by exam, life-experience, community extension, Fire Science, Open College courses (Groups A-W)
(5) Number of credits registered is in excess of credit limitation, dropped none
(6) Number of credits registered is in excess of credit limitation, dropped some, and still in excess
(7) Previous letter improvement needed ⟶ clear ⟶ this letter improvement needed
(8) Previous letter improvement needed ⟶ clear ⟶ this letter satisfactory (full or partial)
(9) Previous letter improvement needed ⟶ SOAP ⟶ this letter improvement needed
(10) Previous letter improvement needed ⟶ SOAP ⟶ this letter satisfactory (full or partial)

Chart 6

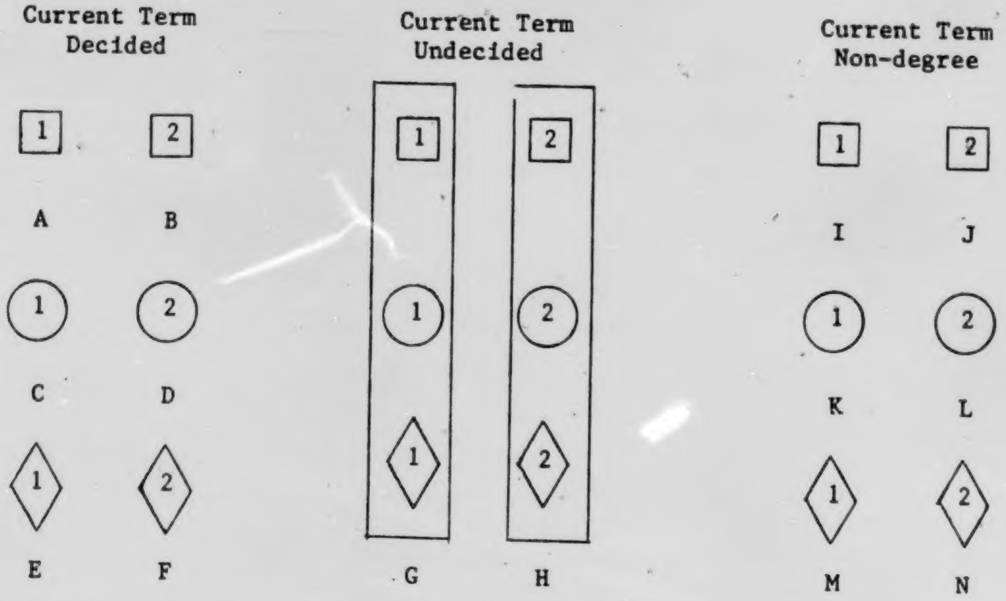
Advisement for Future Registration

Students: Continuing Students not Under SOAP*

Factors Considered for Variable Feedback:

Current Program Code:	Decided, Undecided, Non-degree (as described in Chart 2)
Previous Program Code:	Decided = □ Undecided = ○ Non-degree = ◇
Advisement:	Faculty-Advised = 1, Self-Advised = 2

Groups Formed (A-N) as shown below:


Current Term Decided
Current Term Undecided
Current Term Non-degree
1
2
A
B
C
D
E
F
G
H
I
J
K
L
M
N

Additional Considerations for Variable Feedback for Advisement:

(1) All courses taken off campus (Groups A-N)

(2) 30 or more cumulative credits earned and current term undecided (Groups G-H)

(3) 30 or more cumulative credits earned and current term non-degree (Groups I-N)

---

*Academic Standing is satisfactory under the Standards of Academic Progress

Chart 7

Advisement for Future Registration

Students: Continuing Students Under SOAP*

Group A - Academic Warning

Group B - Academic Probation

Group C - Extended Probation

Group D - Approved Appeals

Group E - Special Summer Programs

---

*Academic Standing is not satisfactory under the Standards of Academic Progress.

RSVP selects one of the 17 primary messages in Chart 1 and as many secondary messages for which a student qualifies. The same principle applies to the other charts (2-7). In the RSVP letter received by the students the primary message along with the secondary message(s) for any one chart form one paragraph. Two paragraphs, one introductory and the other concluding, were designed to tie these paragraphs together to provide a sense of a personal letter. Some examples of these letters are shown in the following pages.

In this section on design we have described the conceptualization for RSVP Academic Alert and Advisement and the outcomes for the students in terms of the RSVP letters. The activities that took place between conceptualzation and outcome are covered under two sections: developmental phase and implementation.

Developmental Phase

The developmental phase involved several persons. At the initial stage, it involved the college's Executive Vice President and Vice President for Education. At the working level, it involved a college-wide committee with 3-4 representatives from each campus and the personnel from the Division of Computer-based Instructional Development and Research and the Division of Systems and Programming. The messages for Charts 1-3 were developed for the first-time implementation in Fall 1978 and those for Charts 4-7 were developed for implementation during the subsequent term. All in all, approximately 150 messages were written, differently for each campus to reflect that campus's unique philosophy and resources. Concurrently, the programming for extracting data from the college's data base for RSVP were carried out. The messages and computer programming have both undergone three refinements between Fall Term, 1978 and Fall Term, 1979 and continue to be refined.

MIAMI-DADE COMMUNITY COLLEGE
NORTH CAMPUS

ENCLOSURE

OCT. 10, 1979

THE NAME AND ADDRESS OF
THE STUDENT HAVE BEEN
REMOVED INTENTIONALLY

DEAR GEORGINA:

WE ARE PLEASED THAT YOU ARE CONTINUING YOUR EDUCATION AT MDCC. I NOTE YOUR GPA OF 1.00 INDICATES THAT YOU ARE HAVING DIFFICULTY. IF YOU CONTINUE TO HAVE DIFFICULTIES YOU CAN FIND HELP IN ACADEMIC ADVISEMENT, ROOM 1101, SCOTT HALL.

ONE OR MORE OF YOUR INSTRUCTORS HAS REPORTED YOUR PROGRESS AND ATTENDANCE IN THE 5 CREDIT HOURS OF COURSE WORK WHICH YOU ARE ATTEMPTING THIS TERM AS NEEDING IMPROVEMENT. TALK THE PROBLEM OVER WITH YOUR INSTRUCTOR(S) AND ASK FOR THE HELP YOU NEED. YOU MAY WANT TO REDUCE YOUR OUTSIDE ACTIVITIES OR YOUR COURSE LOAD. SHOULD YOU BE HAVING TROUBLE WITH ENGLISH, HELP CAN BE PROVIDED FOR YOU ON OUR CAMPUS. COME TO ROOM 1101 AND LET US KNOW IF YOU NEED HELP.

PROGRESS IS SATISFACTORY IN: DEP2000
PROGRESS IS NOT SATISFACTORY IN: APB2190
NO INFORMATION IS AVAILABLE ABOUT YOUR PROGRESS IN: APB2190L
ATTENDANCE IS SATISFACTORY IN: DEP2000
ATTENDANCE NEEDS IMPROVEMENT IN: APB2190
NO INFORMATION IS AVAILABLE ABOUT YOUR ATTENDANCE IN: APB2190L

REGISTRATION FOR THE NEXT TERM WILL BEGIN ON OCT. 29TH. I NOTE THAT YOU HAVE DECIDED ON A MAJOR. YOU SHOULD PLAN TO SEE A FACULTY ADVISOR IN YOUR CHOSEN ACADEMIC AREA TO HELP YOU PLAN YOUR SCHEDULE.

TAKE THIS LETTER WITH YOU WHEN YOU MEET WITH YOUR ADVISOR, YOUR PROFESSOR, OR YOUR COUNSELOR. BEST WISHES, GEORGINA, FOR A SUCCESSFUL TERM.

SINCERELY,
NICHOLAS D. GENNETT, DEAN OF
STUDENT DEVELOPMENT/LEARNING SUPPORT SERVICES

ENTERED
M-DCC 7E-3

MIAMI-DADE COMMUNITY COLLEGE
SOUTH CAMPUS

OCT. 10, 1979

THE NAME AND ADDRESS OF
THE STUDENT HAVE BEEN
REMOVED INTENTIONALLY

DEAR MERCEDES:

WELCOME TO MIAMI-DADE SOUTH. SINCE THIS IS YOUR FIRST SEMESTER AT SOUTH CAMPUS, I HOPE THAT YOU ARE NOW INVOLVED IN OUR COLLEGE AND READY FOR AN ACADEMIC PROGRESS REPORT. THE FOLLOWING REPORT WILL ALERT YOU TO HOW YOU ARE PROGRESSING THIS TERM AND ASSIST YOU IN MAKING DECISIONS ABOUT YOUR PROGRAM OF STUDY.

CONGRATULATIONS...YOUR PROGRESS SO FAR HAS BEEN REPORTED BY ALL YOUR INSTRUCTORS AS BEING SATISFACTORY. IN ADDITION, YOUR READING SCORES ARE HIGH WHICH OFTEN CONTRIBUTES TO ACADEMIC SUCCESS.

I NOTICE, MERCEDES, THAT YOU HAVE NOT WITHDRAWN FROM ANY COURSES SINCE THE 100% REFUND PERIOD. THIS MAY INDICATE THAT YOU HAVE REGISTERED FOR AN APPROPRIATE SCHEDULE. YOU MAY STILL SELF-ADVISE FOR LESS THAN EIGHT CREDITS BUT YOU SHOULD KNOW THAT ADVISORS ARE AVAILABLE TO HELP YOU SELECT YOUR COURSES FOR NEXT TERM. GO TO CAREER PLANNING AND ADVISEMENT IF YOU ARE STILL UNDECIDED OR GO TO THE APPROPRIATE DEPARTMENT IF YOU HAVE SELECTED A MAJOR (LIST ENCLOSED). IF INTERESTED, ASK YOUR ADVISOR ABOUT COURSES OFFERED FOR STUDENTS WHOSE NATIVE LANGUAGE IS NOT ENGLISH.

IMPORTANT RESOURCE CENTERS:
LEARNING SUPPORT CENTER ROOM 6339, 8 AM TO 10 PM, 596-1337.
CAREER PLANNING AND ADVISEMENT ROOM 3232, 8 AM TO 8 PM, 596-1125.

BRING THIS LETTER WITH YOU WHEN YOU DISCUSS YOUR ACADEMIC PROGRESS WITH YOUR INSTRUCTORS AND WHEN YOU SELECT YOUR COURSES FOR NEXT TERM. I HOPE YOU FIND THIS INFORMATION HELPFUL AND I WISH YOU SUCCESS AT SOUTH CAMPUS.

SINCERELY,
BARBARA M. KRANTZ
DIRECTOR, CAREER PLANNING AND ADVISEMENT

ENTERED
M-DCC 79-1

MIAMI-DADE COMMUNITY COLLEGE
SOUTH CAMPUS

OCT. 10, 1979

THE NAME AND ADDRESS OF
THE STUDENT HAVE BEEN
REMOVED INTENTIONALLY

DEAR DEBORAH:

WELCOME TO MIAMI-DADE SOUTH. WHILE YOU HAVE HAD PREVIOUS COLLEGE EXPERIENCE, THIS IS YOUR FIRST TERM AT MIAMI-DADE. I HOPE YOU ARE INVOLVED IN OUR COLLEGE AND READY FOR AN ACADEMIC PROGRESS REPORT.

SO FAR YOUR ACADEMIC WORK IN AT LEAST ONE COURSE NEEDS IMPROVEMENT (SEE LIST BELOW). YOUR DIFFICULTY MAY BE A READING PROBLEM. I DO NOT HAVE A RECORD OF YOUR READING SCORES, HOWEVER, AND URGE YOU TO GO TO THE LEARNING SUPPORT CENTER AND HAVE YOUR READING SKILLS EVALUATED. I HOPE YOU WILL MAKE AN EFFORT TO ATTEND ALL CLASSES REGULARLY. IF YOU ARE HAVING DIFFICULTY IN COMPLETING WRITTEN ASSIGNMENTS, YOU CAN GO TO THE LEARNING SUPPORT CENTER FOR HELP.

IMPROVEMENT IS NEEDED IN YOUR PERFORMANCE AND ATTENDANCE IN: APB2190
IMPROVEMENT IN PERFORMANCE IS NEEDED IN: APB2190L
ATTENDANCE IS NOT UP TO YOUR INSTRUCTOR'S EXPECTATIONS IN: DEP2000

I NOTICE, DEBORAH, THAT YOU HAVE NOT WITHDRAWN FROM ANY COURSES SINCE THE 100% REFUND PERIOD. THIS MAY INDICATE THAT YOU HAVE REGISTERED FOR AN APPROPRIATE SCHEDULE. IT IS NOW TIME TO SEE YOUR ADVISOR, GLORIA TUCKFIELD, ROOM 3232, PHONE 5961125, TO PLAN YOUR COURSES FOR NEXT TERM. IF YOUR MAJOR HAS CHANGED, CONSULT THE ENCLOSED LIST FOR THE CORRECT ADVISEMENT LOCATION.

IMPORTANT RESOURCE CENTERS:
LEARNING SUPPORT CENTER ROOM 6339, 8 AM TO 10 PM, 596-1337.
CAREER PLANNING AND ADVISEMENT ROOM 3232, 8 AM TO 8 PM, 596-1125.

BRING THIS LETTER WITH YOU WHEN YOU DISCUSS YOUR ACADEMIC PROGRESS WITH YOUR INSTRUCTORS AND WHEN YOU SELECT YOUR COURSES FOR NEXT TERM. I HOPE YOU FIND THIS INFORMATION HELPFUL AND I WISH YOU SUCCESS AT SOUTH CAMPUS.

SINCERELY,
BARBARA M. KRANTZ
DIRECTOR, CAREER PLANNING AND ADVISEMENT

ENTERED
M-DCC 79-1

710

MIAMI-DADE COMMUNITY COLLEGE
SOUTH CAMPUS

OCT. 10, 1979

THE NAME AND ADDRESS OF
THE STUDENT HAVE BEEN
REMOVED INTENTIONALLY

DEAR CARLOS:

IT'S GOOD TO HAVE YOU BACK AT MIAMI-DADE SOUTH. I HOPE THE INFORMATION PROVIDED IN THIS LETTER WILL HELP YOU SUCCESSFULLY COMPLETE YOUR COURSES AND REGISTER FOR AN APPROPRIATE SCHEDULE FOR NEXT TERM. ALTHOUGH WE DID NOT SEND A PROGRESS REPORT TO YOU DURING SPRING OR SUMMER TERMS, YOU SHOULD KNOW THAT YOU WILL RECEIVE AN ACADEMIC ALERT LETTER DURING BOTH FALL AND WINTER TERMS.

CARLOS, ACCORDING TO MIAMI-DADE'S STANDARDS OF ACADEMIC PROGRESS, YOUR ACADEMIC RECORD PLACES YOU IN EXTENDED PROBATION BECAUSE, ALTHOUGH YOUR CUMULATIVE RECORD INDICATES SUSPENSION, YOU DID BETTER IN THE LAST MAJOR TERM YOU ATTENDED SCHOOL. YOU MUST COMPLETE AT LEAST HALF OF CURRENT SCHEDULE WITH A 'C' AVERAGE (2.0) OR HIGHER TO CONTINUE YOUR ENROLLMENT AT THE COLLEGE. MAKE AN APPOINTMENT NOW WITH A COUNSELOR IN CAREER PLANNING AND ADVISEMENT TO REVIEW YOUR RECORD, DISCUSS OTHER APPROPRIATE INTERVENTIONS, AND PLAN YOUR NEXT SCHEDULE.

SO FAR AT LEAST ONE OF YOUR INSTRUCTORS HAS REPORTED THAT YOUR ACADEMIC PROGRESS AND ATTENDANCE NEED IMPROVEMENT. REGULAR CLASS ATTENDANCE IS IMPORTANT AND OFTEN CONTRIBUTES TO ACADEMIC SUCCESS. BE SURE YOU ARE ATTENDING ALL CLASSES AS SCHEDULED. YOU SHOULD ALSO CONTACT THE INSTRUCTOR(S) OF COURSES IN WHICH YOU ARE NOT PROGRESSING SATISFACTORILY. IF YOU ARE NOT MAKING SATISFACTORY PROGRESS BECAUSE ENGLISH IS NOT YOUR NATIVE LANGUAGE, CONSULT THE INTERNATIONAL STUDIES DEPARTMENT FOR ASSISTANCE, ROOM 6319, 596-1165. THIS IS NOT THE FIRST TERM THAT YOU HAVE BEEN ENCOURAGED TO IMPROVE YOUR PERFORMANCE. IT IS IMPORTANT THAT YOU MAKE USE OF THE HELP OFFERED.

PROGRESS IS NOT SATISFACTORY IN: ATF1940 ATT1100
NO INFORMATION IS AVAILABLE ABOUT YOUR PROGRESS IN: ATF1100
ATTENDANCE NEEDS IMPROVEMENT IN: ATF1940 ATT1100
IT SEEMS THAT YOU HAVE NOT ATTENDED ANY CLASS IN: ATF1100
CAUTION...FAILURE TO WITHDRAW PRIOR TO THE DEADLINE FOR COURSE DROPS WILL RESULT IN AN "F" GRADE.

EXTENDED PROBATION MEANS THAT YOU MAY BE ADVISED FOR A MAXIMUM OF NINE CREDITS FALL/WINTER TERMS AND THREE CREDITS SPRING/SUMMER TERMS. A COUNSELOR MUST APPROVE ALL COURSES BEFORE YOU WILL BE ALLOWED TO REGISTER. DO COME TO CAREER PLANNING AND ADVISEMENT, ROOM 3232, 596-1125, RIGHT AWAY FOR ASSISTANCE.

KEEP THIS LETTER TO BRING WITH YOU WHEN YOU DISCUSS YOUR ACADEMIC PROGRESS WITH YOUR INSTRUCTORS AND WHEN YOU RECEIVE ACADEMIC ADVISEMENT. I HOPE YOU FIND THIS INFORMATION HELPFUL AND I WISH YOU SUCCESS AT SOUTH CAMPUS.

SINCERELY,
BARBARA M. KRANTZ
DIRECTOR, CAREER PLANNING AND ADVISEMENT

ENTERED
M-DCC 78-1

MIAMI-DADE COMMUNITY COLLEGE
NEW WORLD CENTER CAMPUS

OCT. 10, 1979

THE NAME AND ADDRESS OF
THE STUDENT HAVE BEEN
REMOVED INTENTIONALLY

DEAR REINA:

I AM PLEASED TO SEE THAT YOU ENROLLED AT MIAMI-DADE NEW WORLD CENTER THIS SEMESTER. I WAS VERY HAPPY TO NOTE THAT YOU WERE PLACED ON THE DEAN'S LIST BECAUSE OF YOUR EXCELLENT ACADEMIC PERFORMANCE LAST SEMESTER. CONGRATULATIONS.

CURRENTLY, YOU ARE ENROLLED IN 2 COURSE(S) FOR 4 CREDIT(S). I AM HAPPY TO SAY THAT YOUR PROGRESS AND ATTENDANCE SO FAR HAVE BEEN REPORTED BY YOUR INSTRUCTOR(S) AS SATISFACTORY. YOU MADE A GOOD START TOWARDS ACADEMIC SUCCESS THIS TERM.

I NOTICE THAT YOU SWITCHED FROM AN UNDECIDED TO A NON-DEGREE STATUS. I ENCOURAGE YOU TO REVIEW YOUR DECISION WITH YOUR FACULTY ADVISOR OR WITH A COUNSELOR IN ACADEMIC SUPPORT SERVICES, ROOM 1640. OUR OFFICE HOURS ARE 8 A.M. TO 7 P.M. MONDAY THROUGH THURSDAY AND 8 A.M. TO 5 P.M. ON FRIDAY. TELEPHONE: 577-6714.

IN CLOSING REINA, LET ME SAY THAT YOU AND I SHARE THE BASIC GOAL OF MAKING YOUR COLLEGE EXPERIENCE AS REWARDING AS POSSIBLE. THIS LETTER, WITH ITS ANALYSIS AND RECOMMENDATIONS, INDICATES MY CONTINUING INTEREST IN SUPPORTING YOU IN THE ACHIEVEMENT OF YOUR GOALS. PLEASE BRING THIS LETTER WITH YOU THE NEXT TIME YOU MEET WITH YOUR FACULTY ADVISOR OR YOUR ACADEMIC SUPPORT SERVICES COUNSELOR. BEST WISHES FOR SUCCESS IN THE FUTURE.

SINCERELY,
CASTELL BRYANT
DIVISION OF ACADEMIC SUPPORT SERVICES

ENTERED
M-DCC 78-2

668

MIAMI-DADE COMMUNITY COLLEGE
NEW WORLD CENTER CAMPUS

ADDRESS HOLD

OCT. 10, 1979

THE NAME AND ADDRESS OF
THE STUDENT HAVE BEEN
REMOVED INTENTIONALLY

DEAR GREGORY:

I AM PLEASED TO SEE THAT YOU ENROLLED AT MIAMI-DADE NEW WORLD CENTER THIS SEMESTER. I ALSO NOTE THAT YOUR PERFORMANCE WAS SATISFACTORY LAST SEMESTER.

CURRENTLY, YOU ARE ENROLLED IN 6 COURSES FOR 14 CREDITS. AT LEAST ONE OF YOUR INSTRUCTORS HAS REPORTED THAT YOUR ACADEMIC WORK AND ATTENDANCE NEEDS IMPROVEMENT (SEE LIST BELOW). WE URGE YOU TO DISCUSS YOUR PROGRESS WITH YOUR INSTRUCTORS. IN ADDITION, MAKE SURE THAT YOUR COURSE LOAD OR OUTSIDE COMMITMENTS ARE NOT EXCESSIVE.

PROGRESS IS SATISFACTORY IN: PSY2012
PROGRESS IS NOT SATISFACTORY IN: CHM1046 MAC1114
NO INFORMATION IS AVAILABLE ABOUT YOUR PROGRESS IN: CHM1046L ZOO1010
ZOO1010L
ATTENDANCE IS SATISFACTORY IN: CHM1046 MAC1114
IT SEEMS THAT YOU HAVE NOT ATTENDED ANY CLASS IN: CHM1046L ZOO1010L
CAUTION...FAILURE TO WITHDRAW PRIOR TO THE DEADLINE FOR COURSE DROPS WILL RESULT IN AN "F" GRADE.
NO INFORMATION IS AVAILABLE ABOUT YOUR ATTENDANCE IN: PSY2012 ZOO1010

I NOTICE THAT YOU HAVE DECIDED ON A MAJOR AS OF THE CURRENT TERM. BEFORE REGISTERING NEXT SEMESTER, I ENCOURAGE YOU TO MAKE AN APPOINTMENT WITH YOUR FACULTY ADVISOR TO HELP YOU WITH COURSE SELECTION. PLEASE CONTACT YOUR DEPARTMENT FOR AN APPOINTMENT.

IN CLOSING GREGORY, LET ME SAY THAT YOU AND I SHARE THE BASIC GOAL OF MAKING YOUR COLLEGE EXPERIENCE AS REWARDING AS POSSIBLE. THIS LETTER, WITH ITS ANALYSIS AND RECOMMENDATIONS, INDICATES MY CONTINUING INTEREST IN SUPPORTING YOU IN THE ACHIEVEMENT OF YOUR GOALS. PLEASE BRING THIS LETTER WITH YOU THE NEXT TIME YOU MEET WITH YOUR FACULTY ADVISOR OR YOUR ACADEMIC SUPPORT SERVICES COUNSELOR. BEST WISHES FOR SUCCESS IN THE FUTURE.

SINCERELY,
CASTELL BRYANT
DIVISION OF ACADEMIC SUPPORT SERVICES

ENTERED
M-DCC 78-2

713

Implementation

The RSVP Academic Alert and Advisement system was implemented for the first time in Fall Term, 1978 for 9,706 first-time-in-college students. The implementation involved campus vice-presidents, registrars, all the faculty, computer operations personnel, and personnel for folding (machine-folded) and stuffing the RSVP letters. The faculty completed a midterm progress roll (shown in Figure 2) for each of their classes that had first-time-in-college students. Ninety percent (90%) of the progress rolls were returned by the faculty. In Winter Term, 1979 and Fall Term, 1979, 21,351 and 35,544 RSVP letters respectively were mailed out to the students.

Results and Evaluations

At the administrative, faculty, and student levels, the RSVP Academic Alert and Advisement program was received well and endorsed for continuation. The student evaluation consisted of telephone interviews with 478 students (randomly selected) and the faculty evaluation consisted of a short questionnaire. Summaries of the findings from both surveys are presented in Appendixes C and D respectively.

The RSVP system has an enormous capacity for storage and easy retrieval of data. While space does not permit the inclusion of all the data, some pertinent information is presented in Table I.

After the RSVP Academic Alert and Advisement letters are mailed out at midterm, each campus attempts follow-up projects with special groups of students, such as those needing improvement, international students, etc.

670

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JOB-10 ACA34J00            MIAMI-DADE COMMUNITY COLLEGE            RUN DATE  09/18/79
                                 ACADEMIC ALERT
                                 PROGRESS ROLL

COURSE      INSTR NAME/               STARTING   ENDING     SEQ      PAGE      CAMPUS
            CLASS TIME                DATE       DATE       NUM                DIV/OPT
SS1 1011    ALVAREZ ROLANDO           08/21/79   12/13/79   04245    1 OF 4    300 1 WO

SEQ STUDENT NAME                 STUDENT NO.  PROG ATEND

  1 ABRAHAMSEN ROBERT             8055532 *     *      *  1
  2 ADASME SERGIO ALEXIS          8069123 *     *      *  2
  3 ALBALADEJO ALBERTO            8050023 *     *      *  3
  4 ALFONSO JOSE AGUSTIN          8061416 *     *      *  4 *************************
  5 ALGARRA MAURICIO              8068414 *     *      *  5 *         LEGEND         *
  6 ALTMANN THOMAS P              8069024 *     *      *  6 *      **PROGRESS**      *
  7 ALVAREZ JACQUELINE            8062103 *     *      *  7 * S = SATISFACTORY       *
  8 ALVAREZ MERCEDES              8063804 *     *      *  8 * I = IMPROVEMENT NEEDED *
  9 ALVAREZ ROXANA CARIDAD        8065105 *     *      *  9 * N = NO EVALUATION      *
 10 ALVAREZ XIOMARA CARIDAD       8062015 *     *      * 10 *                        *
 11 APONTE,JR HIPOLITO            8055727 *     *      * 11 *     **ATTENDANCE**     *
 12 ARAGHI MOHSEN DASTDOOZ        7097617 *     *      * 12 * S = SATISFACTORY       *
 13 ARENAS EDUARDO                7097337 *     *      * 13 * I = IMPROVEMENT NEEDED *
 14 BAEZ LEONOR                   8068311 *     *      * 14 * N = NO SHOW            *
 15 BARO MARGARITA XIOMARA        8047534 *     *      * 15 * D = DOES NOT APPLY     *
 16 BARRETT MONA L                8062935 *     *      * 16 *                        *
 17 BARRON,JR WILLIAM LESTER      8068142 *     *      * 17 *************************
 18 BAS ROMAN E                   8052635 *     *      * 18
 19 BELTRAN BERNIE                8069207 *     *      * 19
 20 BENCOMO MAYDA JOSEFINA        8061710 *     *      * 20
    BENOIT SERGE                  7106147 *     *      * 21
    BETANCOR TANIA MARIA          8047536 *     *      * 22
 23 BLACKMON SABRINA ANNETTE      6090933 *     *      * 23
 24 BROOKS DEBRA                  8067527 *     *      * 24
 25 BROWN HAROLD DEVONE           8059942 *     *      * 25
 26 BUSTILLOS MANUEL JORGE        8057245 *     *      * 26
 27 BUTLER FRED BERNARD           8057204 *     *      * 27
 28 CAMPBELL JEFFREY L            6118407 *     *      * 28
 29 CARDONA GLORIA C              8062106 *     *      * 29
 30 CARRION WILLIAM               8064609 *     *      * 30
 31 CARTER HELEN DORIS            8068147 *     *      * 31
 32 CASTRO MARTHA ALEXANDRA       8049533 *     *      * 32
 33 CERNADAS ALEJANDRO            8063136 *     *      * 33
 34 CHISHOLM AVA SUZANNE          8061004 *     *      * 34
 35 CHRISTIE BART DONALD          8067127 *     *      * 35
 36 COLLS ODALIS AGUEDA           7103828 *     *      * 36
 37 CONCEPCION SILVIO BAEZ        7009310 *     *      * 37
 38 CORDERO WALTER ERNESTO        7063150 *     *      * 38
 39 DELAROSA BERTHA LYDIA         7108130 *     *      * 39
 40 DELGADO-GUANCHE MIRNA         8061738 *     *      * 40
 41 DEMETRIC MIRMONDE L           8066407 *     *      * 41
 42 DEWENT GILBERT                8061723 *     *      * 42
 43 DIAZ ANA LOURDES              8069333 *     *      * 43
 44 DOKTORCYK MARY SUSAN          6121724 *     *      * 44
```

Figure 2

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                                                       -------------------------
                                                               SIGNATURE
  KEYPUNCH - COLUMNS 67-80 FOR PROG CARD  PUNCH 01791300042451
  KEYPUNCH - COLUMNS 67-80 FOR ATND CARD  PUNCH 01791300042452
```

715

TABLE I

RSVP ACADEMIC ALERT AND ADVISEMENT STATISTICS

	Fall 1978		Winter 1979		Fall 1979	
	New	Continuing	New	Continuing	New	Continuing
Number of RSVP letters mailed out.	9,706	-	8,187	12,164	11,983	23,561
Number of students active.	9,706	-	8,187	7,955	11,983	12,134
Students with Satisfactory progress.	40%	-	46%	45%	48%	46%
Students needing improvement.	43%	-	33%	49%	35%	39%
Students with no information.	17%	-	21%	6%	17%	15%
Students with poor attendance.	31%	-	29%	38%	25%	28%
Students decided about a program.	72%	-	52%	67%	65%	68%

While Miami-Dade continues to refine and evaluate the Academic Alert and Advisement system, approximately 35,000 students are provided with individualized advisement all within a span of a week (from computer processing to mailing). The quantity and quality of information included in the RSVP advisement letters gives promise for better course selection and better utilization of support services. Thus, computer technology can be creatively applied to the academic advisement process. While reliance on computers may seem to present an antithesis to the humane aspects of academic advisement, Miami-Dade believes that it is well on its way to demonstrating that the essential elements of human intervention can be enhanced through computer-based academic advisement.

Appendix A

MIAMI-DADE COMMUNITY COLLEGE

STANDARDS OF ACADEMIC PROGRESS

Effective Fall Term, 1978

The primary purpose for adopting new standards of Academic Progress is for the College to be better able to identify and provide assistance for students with academic difficulties. Most students at Miami-Dade do make satisfactory academic progress. However, for those students who experience academic difficulties, the Standards of Academic Progress will alert them and the College in order to correct academic weaknesses at an early point in their college career. The standards include limiting the number of credits for which students register and prescribe specific kinds of assistance.

The Standards are not intended to discourage or penalize students who are sincerely trying to make good use of the College's instructional services. Rather, the College is committed to providing students as much assistance as possible, so they may be successful in achieving their educational goals. The new Standards of Academic Progress provide students a variety of means to solve their academic problems and to begin to make satisfactory progress. The overall effect of these new Standards should be more satisfactory performance by students in their courses, better use of the special resources provided for students having academic difficulties, and increased public support for the College's efforts to provide sound educational programs of the highest quality.

ACADEMIC STANDARDS CATEGORY	RESULT
A. 7-16 credits attempted with less than a 1.5 cumulative grade point average	Academic warning
B. 17-29 credits registered for but earned credit in less than half	Academic probation
C. 17-29 credits attempted with less than a 1.5 cumulative grade point average	Academic probation
D. 30+ credits registered for but earned credit in less than half	Academic suspension*
E. 30+ credits attempted with less than a 1.5 cumulative grade point average	Academic suspension*

Note: In calculating the category of courses registered for but earned less than half, incomplete grades (I) and audit grades (X) will not be calculated.

DEFINITIONS: STANDARDS OF ACADEMIC PROGRESS RESULTS

Academic warning signifies there will be a limitation of 9 credits in the Fall Term, 9 credits in the Winter Term, 3 credits in the Spring Term and 3 credits in the Summer Term. In addition, students should take 3 or more credits as part of a prescribed program of intervention which attempts to assist the student. In such cases, the limitation of credits may be increased to 12. This program of intervention may include developmental studies, a study skill course, career counseling or a combination of all three.

Academic probation signifies there will be a limitation of 9 credits in the Fall Term, 9 credits in the Winter Term, 3 credits in the Spring Term, and 3 credits in the Summer Term. As part of the credit limitation students should have 3 or more credits prescribed as part of a program of intervention.

Note: Students in this category (academic probation) who on the basis of each term's performance earn half of their credit and maintain a 2.0 term grade point average will never be suspended for academic reason.

*Academic suspension requires a student to discontinue enrollment at Miami-Dade through the next major term. (Neither the Spring Term, nor the Summer Term, nor the combination of both is considered a major term.)

Probation after suspension. Students who discontinue their enrollment because of suspension during a major term may reenter the College and continue for each subsequent term of enrollment, provided they maintain a 2.0 term grade point average and earn credit in at least half the credits for which they register.

Academic dismissal represents a separation of the student from Miami-Dade Community College for at least twelve months. Academic dismissal occurs after students fail to meet the minimum requirements during probation after suspension. If, after being readmitted following suspension, the students fail to meet minimum standards, which are maintaining a 2.0 term grade point average and earning credit in at least half the courses for which they are registered, they will be separated from the College.

Students are eligible to apply for readmission to the College after the dismissal period. Admission will be on a petition basis; in order for readmission to be approved, the petition must present evidence of some change in the student's circumstances.

Miami-Dade Community College
11011 S.W. 104 Street, Miami, Florida 33176

Medical Center Campus
950 N.W. 20 Street
Miami, Florida 33136

New World Center Campus
300 N.E. 2 Avenue
Miami, Florida 33132

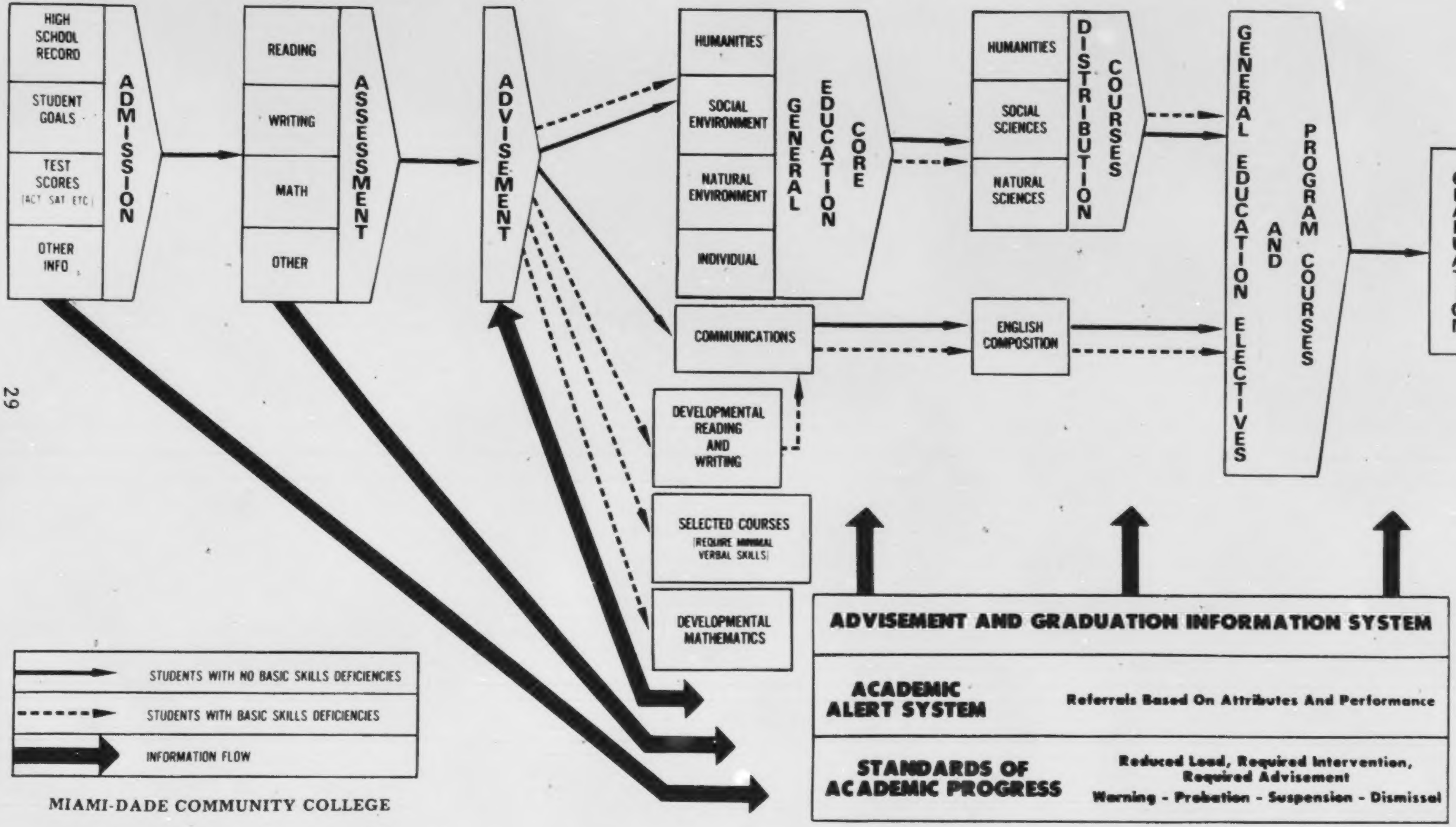
North Campus
11380 N.W. 27 Avenue
Miami, Florida 33167

South Campus
11011 S.W. 104 Street
Miami, Florida 33176

M-DCC Policy, Effective Fall Term, 1978 and thereafter.

*Continuing, former, and transfer students phase into Academic Standards of Progress during Fall and Winter Terms, 1978-79. There will be no academic suspension for any student during this period.

ASSOCIATE IN ARTS STUDENT FLOW MODEL


HIGH SCHOOL RECORD
STUDENT GOALS
TEST SCORES (ACT SAT ETC)
OTHER INFO
ADMISSION
READING
WRITING
MATH
OTHER
ASSESSMENT
ADVISEMENT
HUMANITIES
SOCIAL ENVIRONMENT
NATURAL ENVIRONMENT
INDIVIDUAL
GENERAL EDUCATION CORE
COMMUNICATIONS
DEVELOPMENTAL READING AND WRITING
SELECTED COURSES (REQUIRE MINIMAL VERBAL SKILLS)
DEVELOPMENTAL MATHEMATICS
HUMANITIES
SOCIAL SCIENCES
NATURAL SCIENCES
DISTRIBUTION COURSES
ENGLISH COMPOSITION
GENERAL EDUCATION ELECTIVES AND PROGRAM COURSES
GRADUATION
ADVISEMENT AND GRADUATION INFORMATION SYSTEM
ACADEMIC ALERT SYSTEM
Referrals Based On Attributes And Performance
STANDARDS OF ACADEMIC PROGRESS
Reduced Load, Required Intervention, Required Advisement
Warning - Probation - Suspension - Dismissal
STUDENTS WITH NO BASIC SKILLS DEFICIENCIES
STUDENTS WITH BASIC SKILLS DEFICIENCIES
INFORMATION FLOW

MIAMI-DADE COMMUNITY COLLEGE

Appendix B

Credit for Appendixes C and D

goes to:

John Zeien

Assistant Dean of Students

South Campus

Miami-Dade Community College

Appendix C

TELEPHONE SURVEY RESULTS FROM STUDENTS RECEIVING ACADEMIC ALERT ADVISEMENT LETTERS - Fall Term, 1978

A survey sample of 398 students was randomly selected from the four campuses of Miami-Dade Community College to gather information concerning student reaction to the Academic Alert and Advisement letters mailed during the Fall Term, 1978. Forty students from the sample could not be reached by the callers. An additional forty-three students indicated that they did not recall or stated they did not receive the letters. The following information is from those students who did receive the Academic Alert and Advisement letters and were able to provide information for the telephone survey.

1. The telephone survey had a 90 percent contact or "hit" rate from the sample. Of those reached, 88 responded "yes" when asked if they had received the letter.
2. Of those receiving the letter, 99 indicated that their letter was clear to them; 89 percent stated that their letter was accurate.
3. The survey was designed to discover if the students were inclined to discuss their letter with their instructors or other persons. The survey data reveal that:
    a. 19 percent of the students discussed their letter with their instructors.
    b. 9.2 percent discussed their letter with their faculty advisor.
    c. 8 percent of the students discussed their letter with other students.
    d. 29.5 percent discussed their letter with their parents.

4. The survey was also designed to discover if the students responded to any of the suggestions made in their letters. The survey data reveal that:
    a. 12 percent inproved their attendance in classes that were reported as needing improved attendance.
    b. 3.8 percent contacted their campus learning support center.
    c. 2.2 percent sought career counseling.
    d. 11.7 percent dropped courses after receiving their letter.
5. The survey was designed to discover if students would use the letters in Academic Advisement. The survey data revealed that 11.9 percent did take their letter to advisement, 28.7 percent did not take their letter with them to an advisement session, and 59.4 percent had not yet been advised at the time of the survey.
6. 93 percent of the students receiving letters felt that the letters should be continued in the future. Some individual comments from students:
    a. Send letters out after midterm exams.
    b. Show grade point average in letters.
    c. Tells how you are doing - very good idea to send letters.
    d. Letters very helpful.
    e. Did not like the use of the word "satisfactory": sounds too average.
    f. Letters very good - Lets students know where they stand before end of term.
    g. Student feels he is not just a number because the College cares enough to send letters.

Appendix D

Preliminary Report

Academic Alert Faculty Survey

The Miami-Dade faculty was surveyed to discover their reaction to the Academic Alert and Advisement System during the Winter Term (78-2). A 50% sample of the faculty was selected from the payroll records of the college. 393 questionnaires were distributed to the faculty. A response rate of 49.1% from all the campuses was achieved for this survey. The following information outlines the results in a preliminary fashion:

1) 94.1% of those responding indicated that they made use of the Academic Alert grade rolls during the 78-1 Fall Term. 96% of the respondents found the format of the grade rolls easy to understand.

2) 75.9% of the faculty respondents reported that students who received notification of needed improvement in progress (in class) "did not" contact faculty or that "very few" contacted faculty to discuss this information. Attendance in class received a similar response rate (79.4%). Students who were considered "no shows" to class by faculty received notification of attendance from their faculty. 94.7% of the faculty reported "very few" or "no" responses from this group of students.

3) The faculty reported that "very few" (23.9%) or "none" (53.3%) of the students brought the letters they received to conferences with their teachers.

4) 79.4% of the faculty indicated that they were able to adequately rate student progress in class at seven weeks; 20.6% indicated "no" to the question. The basis for the evaluations by faculty were:

	% No	% Yes
Daily Quizes	76.2	23.8
Reports	65.3	34.7
Class Participation	37.8	62.2
Tests	30.1	69.9
Other Means	89.6	10.4

5) The faculty were asked whether or not they perceived improvement in class attendance or class progress in students they identified for the Academic Alert letters. 29.7% of the faculty reported attendance improvement for categories of "nearly everyone" or "most"; 43.6% and 26.7% were reported for categories of "very few" and "none" respectively. Progress improvement for "nearly everyone" (0.6%), "most" (25.8%), "very few" (55.2%), and "none" (18.4%).

6) Faculty who had advisement responsibilities were asked if their advisees brought their Academic Alert letters with them to the advisement conferences. 31.1% of the faculty reported "yes"; 68.1% reported "no." There were 58 missing responses to this item.

7) Faculty were asked if they thought students would follow the recommendations made to them in the Academic Alert letters. 43.4% of the faculty indicated that (in their opinion) "half or more" of the students would respond to the recommendations received via the letters. 56.6% indicated that "very few" or "none" would respond.

8) Faculty assessment of the students' reactions to receiving the Academic Alert letters was as follows:

	%
Positive	38.3

	%
Negative	6.2
Indifferent	55.5

9) Faculty were asked if they felt that the Academic Alert and Advisement System had positive benefits for faculty. This question required a write-in response. Some comments received were:

a) Too much paperwork.

b) Yes - if it encourages students to seek help.

c) Helps to pinpoint weak students.

d) Only if students follow up.

e) Not any more than my usual class system except that system reaches students not attending.

f) Reinforces what I try to do individually in class.

g) It singles out the students who need more individual attention.

10) A series of statements was presented to the faculty respondents to gather information on their overall assessment of the Academic Alert and Advisement System. Faculty were asked to check items or statements that "applied." The results, tabulated as yes/no responses, were:

	% Yes	% No
a) Positive move to improve quality of student performance	52.8	47.2
b) Can, with modifications, provide benefits for students	38.3	61.7
c) It's spoon-feeding	8.8	91.2
d) Encourages students to contact faculty to solve academic difficulties	51.8	48.2
e) Helps in the academic advisement of students	40.9	59.1

	% Yes	% No
f) Is just another administrative duty for faculty members	15.0	85.0
g) Promotes retention of students	28.5	71.5
h) Identifies potential high-risk student early on	65.3	34.7
i) Administrative dabbling in the classroom	2.1	97.9

11) Finally, 88.1% of the faculty indicated that the Academic Alert and Advisement System should be continued; 11.9% responded in the negative.

A SYSTEMS APPROACH TO A BETTER UNDERSTANDING OF THE LEARNER

Greg Markovich
Small College Consortium and Services for
Institutional Advancement and Management
Washington, DC

This paper is an overview of the current and future applications of management information systems that can assist in a better understanding of the learner. It highlights the philosophical foundation, the functional framework and operational systems methodologies that are necessary to design, develop and implement a learner-centered management information system. Of particular interest to systems persons is the development of a new, enhanced role for the practitioner and the development of a Systems Synergy Group. Highlights of a learner-centered data base is presented that is built upon student development models.

THE FOUNDATION

Personal Perspective

Having been involved in systems since 1963, I feel like a war historian who also served on the front lines. I am able to recall the battles and the tactics used. I have seen the equipment evolve, the definitions change and the enemies change sides. It is from these experiences that I present yet another hill to charge and challange to face.

Essentially, as I look back upon these experiences I recall the days when I was a Methods and Systems person and the involvements were with forms, people and processes. Then I became a Systems Analyst with Xerox and it was computer, processes and programmers. People were no longer included in my job. We still had a Methods and Systems person but that was an old timer that hadn't caught up, maybe his job still included the responsibility to work with people. From industry I immigrated to education and started a one person shop. I initially concentrated on systematizing Registration to make it more efficient and effective. One day looking from my window into a Southern California rain and seeing students waiting in registration lines it dawned on me that the students were a group of users of my system and I hadn't even talked with one of them about the so called improvements. I think that is why I'm here today to discuss the utilization of systems technology to better understand today's learner and perhaps even improve the learning-living environment.

One of the most significant groups of users that we have on our campus are the learners. This past January I spent a day with the President of the W. K. Kellogg Foundation and he asked me over and over again how would "x" project benefit the learners. It was a lesson well learned again. Some of us have had the joy of building a system from the beginning and have experienced pre-admissions data, admissions data, registrar data and financial aid data become alive and represent efforts in admissions, the marketing thrusts, local financial conditions and most importantly lifes that will receive the benefits that your institution has to offer. But all too often we have data and numbers, not information on learners, nor information on resources and the learning environment. We have functionalized the learner words like... inquiry, payee, admittee, FTIAC ... are symbolic of this effort. How many of us have a student master file with learning style as a data element. Do we have a student development file or any application other then housing. Do we have an inventory of learning resources available on campus or are we still counting filing cabinets. Of course you can answer I do not know learning styles, student development concepts...but the role of the systems person is not just computers, processes and forms but really one of creating linkages, facilitating organizational development and providing systems technology to improve; delivery systems, problem solving and decision making which enhances the welfare of all users to include the learner.

Professional Prospective

From a professional prospective, the evolution of the systems approach in higher education is in its "umpteenth" generation or perhaps in its first if you consider this presentation. The specialization of the profession in higher education has developed as quickly as industry. We have:

Instructional systems analyst (with or without audio-visual)
Academic-computer systems analyst
Computer-assisted-instruction analyst (w/wo computer managed)
Administrative support analyst (with classifications, student records, business office, etc)

And of course we have the equipment (environment) classifications within this framework to further structure to wit: Small college, university, multi-university, statewide system and micro, mini, midi, large and even networks and satellite computer installations (or galexies).

We all know that technology has taken tremendous strides. The place of the systems person is generally with maxi-machines, and we have fought hard for our positions. The improvements of technology affects our positions but there are even stronger impacts that will threaten our very existence: Retrenchment, reduction and reallocation of resources is a reality of the 80's.

As our role is changing and being questioned, higher education is changing. The historic academic community has new consumers, new methods of delivery and new responsibilities (and the associated accountibility).

Recent displays in The Chronicle of Higher Education have included:

How to Recruit Students Using Direct Response Marketing

A Data Driven Retention Model for Improving Minority Student Persistence on Predominately White and Historically Black Colleges and Universities

Systematic Faculty Evaluation

Education for Each: Designing Academic Improvements

The increase of publications in the areas of Student Development, Career and Advising, Learning Styles and Instructional Modes of Delivery are another indicator of academe's responses to the new consumer and accountibility concerns. In reviewing these changes whether they be improved technology, increased learner accountibility or the changing academic enterprise; it behooves the systems person to become introspective of their role and ascertain how are we going to respond. Can we remain being the machine and process oriented technician and centered on office subsystems or do we look towards another direction.

Financial Perspective

Let me direct your attention to yet another influence during this decade of change; your budget and your future.

Most of us have been in those meetings in which our budget was generated. Our budget could have come from chargebacks (i.e., doing Registrations, providing Business Office services etc) or be driven from a set of givens; "if you have type A machine you need one systems person, two programmers and a partridge in a pear tree". Typically we have a budget (if one computer is included) in the two to four percent range. Or we are equated to an FTE.

If we were to look at the entire budget of a typical small college we would see some very interesting data such as:

Recruitment cost per matriculant ranging from $250 to $800 per student

Institutional Advancement costing from 15 cents to 50 cents per dollar raised

Retention rates being as low as 30 percent to as high as 70 percent

Student development services consuming 8 to 10 percent of the budget

Academic programs and support services accounting for 40 to 50 percent of the budget

In reviewing the literature we immediately see a void of the application of systems technology in these areas especially in retention activities and student development services. If we utilize the data processing generation schema as a yardstick most efforts are in their first generation of implementation and are being operated in a fourth generation environment and marketplace.

Perhaps we are not focusing our systems efforts on the right market. Sure we can improve registration, speed up billing and even help in computer assisted instruction. But there is another marketplace for our talents and it is in these Learner Associated areas. These Learner Associated areas represent well over 65 per cent of the budget. These areas are the targets of retrenchment, reduction and reallocation efforts and many of them have the lightest accountibility and outcome measures indexes. Looking at our campus with a futures perspective we can readily see that our efforts need to be rechannelled into new areas that have higher return on investment for the learner.

We are the Return on Investment specialist we can cost justify any piece of hardware we want; but yet we are not building a Return on Investment of our efforts in behalf of the learner.

I assure you if you go into your President's office and say you are going to help develop a system to improve retention you will receive blessings. If you approach the Student Development professionals and share with them ways systems can assist them in justifying their budget and improve delivery systems you will have another new client. The Academic Dean is looking for ways to improve services to learners and you have some of the answers. When I review the list of all new classifications or see the ads in the Chroncile I see the most important classification and ad missing and that is of the systems person that is specializing in improving the learning-living environment.

It is from these perspectives and prospectives that I have created this presentation and challange. As a systems person I know that it our responsibility to provide linkages, create the information systems that will collect, store, manipulate and display data to assist decision makers. I challange you to go the extra step and attempt to apply your skills to the learner and the environment. For who is better equipped then the "pure" systems person, to look at all areas, be objective, gather data, formulate alternatives, assist in applying an alternative, seek feedback and evaluation and discover another need. If you wish to undertake this challange an operating framework must be created to provide guidelines.

THE FRAMEWORK:

Training Requirements

From this philosophical foundation we are now ready to build the framework in which the application of the systems approach will function within. As in any new endeavor the first question is what training will be needed, does the institution have the resources? What background and training does the systems person need to have to engage in this challange. There are several responses to this question:

a. Learn another specialization (i.e., Instructional Systems, Student Development, etc)

b. Self-education with general knowledge in new areas

c. Formulate mini teams (an area specialist and yourself).

But there is another alternative...the alternative of forming a Systems Synergy Group that is dedicated to improving the learning and living environment through the utilization of systems technology. The members of this group would come from all areas on campus and definitely would have learners as members. This action oriented think tank could cut across department lines and be centered on the institution and the learner. Many of our campuses are very office centered and only utilize the resources within an office to solve a problem and never realize the impact of their area upon other areas. One of the non-intended outcomes of planning or building a management information system is the increase in the communication levels on campus and the changes in communication paths. The formulation of this group would also have that as an intended outcome. If this group is formulated there is not one small college in the country that does not have the resources available to apply systems technology to learner associated areas and your role is to provide linkages and data.

Having recognized the training needs, the skills and abilities and educational backgrounds necessary we are now ready to:

1. Formulate our campus objectives.
2. Gather our initial data base.
3. Educate the community in regards to systems technology.

Formulating Campus Objectives:

The purpose of this activity is to set general directions for the work group. As we all know the task of setting objectives can take many forms and the process can become an end to itself. When setting objectives for this work group an unintended objective is to communicate that there is group concerned about the learner that spans the entire campus. The group that assists in setting objectives should consist of interested parties as well as those that are on the fringe of accepting the idea and the group must consist of a person that can demonstrate the commitment of top administrators. As with any objective these objectives need to be:

a. Measureable, b. refer to person performing activities,
c. refer to person, groups receiving outcome from activities,
d. have date or event signifying accomplishment and must
e. indicate learner benefit derived from objective

Examples of objectives that a group like this may create are:

> Initial learner based needs analysis activities will be conducted by the Academic Dean, Student Development and the Registrar to determine the current situation in the areas of Career Information Needs, Advising Satisfaction and learning trends in career selection. The needs statement will be completed by October 5, 1979. This needs statement will be utilized to make decisions on Career Library Acquistions, Advising Assignments etc.

As can be seen from this objective this group is creating an objective that is action oriented.

Another example of the objectives of this group could be:

> The group will formulate an action plan by October 5, 1979 that will indicate how the utilization of systems technology will be utilized at Small College to assist the learner in receiving the best education possible.

Regardless of the form that your objectives take they do need to be formulated to give direction and guidance not only to the group but also to the rest of the institution.

Developing Initial Data Base

Before we start rebuilding the educational environment we need to have a data picture of the current environment. Our picture must be objective but it also must include the subjective nature of our institution. A state of the union message must be developed. The message could include:

Information on Learners: Who are they-educationally (what environments and methods have they learned in previously). What delivery modes are perceived by them to be more helpfull. What are their studying habits. Who are they as persons from a developmental standpoint, are they seeking their own identity, are they peer oriented. Who do they want to be. What are their academic and career aspirations, what do they know about the world of work, do they desire and educational experience that includes, internship, cooperative education or other experience based activities.

Information on Resources: This includes all resources that are available; campus, and within the immediate community. This includes teaching styles, indepth information on the classroom experiences, audio-visual support, library holdings, facility designs, careering and advising activities, student development activities and any other resource that is available in the learning-living environment.

Information on Current Situation: What are the current retention activities, what happens with information from the admissions process, how are student development activities programmed, when was the last climate study done on campus, what do the learners think about the current experience.

The creation of this data base is essential to the implementation of the utilization of the systems approach. We must have data to ascertain needs, understand resource allocation and infomation on current processes to formulate alternatives. But the next element is the key to developing the operational definition and framework for our tasks. We can have objectives and data but we need the implementation strategy that is inherent to "pure" systems technology to accomplish our objectives. The first step is:

Educating the community in regards to systems technology:

This is a very important step, this is the framework that we are attempting to operate within and from,and the community must be familar with the steps to the approach and the mechanics and reasoning associated with the outcomes. These techniques are rather generic in nature but unfortunately are not practiced by the entire community, an example of a systems approach follows:

Needs Analysis Activity - an activity which specifies where the organization (or learner) is at present and needs that are present.

Objectives - based upon the needs analysis establish the objectives that will be accomplished and the resources necessary to accomplish that objective.

Constraints - based upon the local environment what are the constraints on accomplishing the proposed objective.

Alternative - develop the actions with alternate modes to accomplish the objectives considering needs and constraints.

Selection - based upon alternative-actions available make choice of methodology.

Implementation Plan - based upon selection develop full plan for implementation with critical path network.

Evaluation - use milestone checkoff and performance evaluation to assure approach is approach and objective is being met.

Modification - determine, deletions, additions and feedback.

In addition to the adoption of the systems approach to your campus operating styles, a thorough understanding of the change process on your campus must be considered and this process must be adjusted to your campus environment. Having formulated this operational framework, consisting of the Systems Synergy Group, objectives for the group, a data base to provide information and systems methodology to be utilized for implementation efforts; it is a good idea to pilot test all of these elements prior to launching into the big arena of change. Find an area (or office or process) on campus that needs improvement and has a direct connection to the learners. Test your group, formulating an objective that is action oriented, utilizing your data base and most important the systems approach. Make modifications, adjust the operating elements as appropriate. With this pilot testing you are now ready to go into the Future.

THE FUTURE

From this empirical framework and foundation the systems person is now ready to undertake a major challange of applying systems technology to the learning environment. The design, development and implementation of systems to improve the campus from a learning point of view is not easy. The number of departments that are involved, the small empires, the historical domains that have not been challanged are numerous and the general resistence is beyond understanding. To build a campus wide system that includes all learner activities is a tremendous undertaking. The methods of implementation could consist of phases by area or even the high risk approach of tomorrow its going to be like this.

Regardless of the approach taken there are definite actions that need to be included; they are Needs Analysis, General Systems Design, Detail Systems Design, Implementation and Evaluation. For these actions to be undertaken the systems person must first develop the blueprint for operation, i.e., is a top-down approach, pyramid approach, theme approach, office centered approach, etc, going to be utilized. Secondly the systems person must realize that these activities are going to center on the learner and that the institution is going to be the second priority. Because of the interface involved with the learner and the environment and its supporting offices it is best to look for ways to adjust, enhance and exchange current processes to accomplish the overall objectives. The improvements implemented must be able to link to the current institutional processes and data sets. Some of the traditional data sets that will be helpfull are; Admissions, Registration, Faculty and Course Master File, Personnel, Facilities, and Budget. Linkages to these data sets and associated processes will greatly increase utilization of the enhanced system and provide for means of data capture, storage and most important the on-going maintenance function. With these general guidelines in mind and the priority being the learner we are now ready to launch into needs analysis.

NEEDS ANALYSIS -

During this step we will also formulate the objectives and general directions for the systems activities. Essentially, the major questions that need to be answered in this step are:

1. What does the learner need in the form of information, services, and experiences to have an improved situation.
2. What does the institution (and its offices) need from the learner (and its operational environment) to improve the current situation.

There have been several efforts on the national level to assist students (learners) in obtaining better student information. The CHOICE project is one of these efforts. One non-intented outcome of any effort we make with students (learners) to give them more information we usually receive more and better information from them. The key to a good admissions effort is the exchange of all types of information, especially information that begins to involve the prospective learner with the total educational experience. In your group there should be enough experiences and blue sky people to respond to both these questions. But there are some answers already available in the literature of student development and in learning styles. By utilizing the framework of these models we have; the beginning of the data elements necessary to build the system and the beginnings of the interfaces that are necessary to impact the environment. Some of the generic needs that have been discovered relate to the "whole person" concept of education. During the needs analysis activity the institution's responses to these needs, through its processes and resources should be ascertained. The learner would also be interviewed to determine the level of the need. Of course, the institution may determine that some needs that the learner comes with will not be meant. Some of the basic data elements that need to be gathered are psychographic and can be captured through interview and questionnaire approaches. The end product of this needs analysis activity should be a statement of the current state of the union. It should contain the needs of learners in the areas of information, resource education and environment capability.

The various offices, functions, processes and professionals (both faculty and others) should have had the opportunity to express their needs in the area of additional learner based information, campus resources and overall educational mission accomplishment. Based upon this Needs Analysis Statement the task of General Systems Design can be undertaken.

GENERAL SYSTEMS DESIGN -

This task can be accomplished in a variety of ways. Using the Needs Analysis Statement as the launching point the various data needs, processes and functional enhancements can be ascertained. Having accomplished this a general schema can be formulated to accomplish the objectives outlined. This subsystem approach can function quite adequately but it sometimes does not impact all areas. Another approach that has proven successful is the theme approach. For example the theme of Career Information can be chosen as the center of the systems design effort. If it was (assuming the Needs Analysis Statement and the institution desired to accept the responsibility) all of the processes, functions and offices that the learner experienced would be reviewed for their impact upon the theme. A general schema consisting of all of the inter-actions pertaining to Career Information would be developed and those needs ascertained during the Needs Analysis phase would be reviewed based upon this schema. Those processes, functions and offices that were impacted by these needs would be included in the general level re-design and enhancement plans. The real advantage of this approach is the ability to track data, processes and the impact for the learner. Another approach is the office centered approach with multi-themes. In this approach each office is reviewed for all data, processes and functions that it has that are generally considered non-primary. In Admissions this would mean what data and processes during the Inquiry phase impact the Academic Dean, Student Development Office and other functions on campus. Additionally, the process of Admissions would be reviewed to ascertain what impact it had upon retention, initial classroom experiences and faculty concerns. The end product of the General Systems Design phase would be a general schema that would include data, inputs-outputs and processes that needed to be enhanced to improve the learning-living environment.

DETAIL SYSTEMS DESIGN -

The purpose of this activity is to create (or recreate) the processes and functions, data collection methodology, data display proceedures and other associated activities that have been determined to support the systems effort of improved learning environment. This does not include computer programming in this step but the consideration must be kept in mind. We would design the inputs-outputs and the data collection methodology to support the needs outlined in the Needs Analysis activity and included in the General Systems Design phase. The data manipulations, linkages and timings would be outlined and their impact upon current systems would be explored. Those processes, functions and offices that would be affected would have a "Before" and "After" picture developed with all intended changes noted and the interfaces that were affected. The product of this activity would be a paper based detailed level schema of the whole system and appropriate subsystems. A person could look at a need (from the Needs Analysis activity), see how it was going to be met in the General Systems Design phase and see in the Detail Design Phase the specific actions to meet that need. Having completed this phase it is now appropriate to think about implementation.

IMPLEMENTATION PHASE -

This phase has two steps. The first step is the determination of what methods will be utilized to implement the system. The Constraints, Alternatives and Alternative Selection activities would be accomplished in this first step. At this time an implementation plan is developed and the resources to actualize the plan are considered. The implementation plan should contain all changes and system enhancements regardless of whether they are going to be implemented. Having decided what methods are going to be utilized to implement the Detail Systems Design the second step, is the beginning of the actual effort to implement the system. If computer programming was involved it would start now, forms and processes would start to be changed and other modifications being made. At this time another very important step would also be initiated; the Evaluation phase.

EVALUATION PHASE -

This is the key step. This phase sets the stage for future work and insurance of system acceptance. Before and after data needs to be gathered. Learners interviewed and on the site reviews need to be conducted. Are the needs being met are the goals and objectives being satisfied...these are questions that an evaluation plan must be prepared to respond to. This phase would also include the opportunity for modification and additional needs assessment.

This is a vital element of the systems approach. One approach to accomplishing this objective is to form an Evaluation Team from another area on campus or even off campus. A number of small colleges have utilized this approach with great success. In the plan of implementation key check points should be developed that interface with the evaluation plan. The evaluation plan must consist of the processes not only to evaluate the system and its impact but also, the timelines, systems' efficiencies and operational capabilities outlined in the systems' documentation.

Having accompished the above activities, we are now ready for the future. The question of understanding the learner can be answered in this approach. Learning styles, change agents, career aspirations and personal goals of learners are just a few of the data elements that can be collected. But I caution you on collecting data, for this new personal data can also be stored and not used for the learner's benefit. I challange you not to the collection of data but rather to the first generation of the utilization of the systems approach to improve the learning and living environment.

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SOFTWARE DEVELOPMENT SHARING IS BECOMING A REALITY

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I. INTRODUCTION

A software cooperative, initially established by the Massachusetts Board of Regional Community Colleges (MBRCC), is intended to permit colleges and universities to share the research and development costs of a "comprehensive information system." The software cooperative now has eight members. Other colleges have expressed an interest in joining.

The idea of a "software cooperative" was originally recommended by a task force at North Shore Community College (Beverly, Massachusetts), appointed by the President to determine the computing needs and strategic alternatives of the college. The North Shore staff recognized that the college could not afford to develop the software required to meet the needs identified. The concept has been accepted by about half of the other members of the Massachusetts Community College system. Four members of another multi-campus are evaluating joining the software cooperative. Technical support is provided by Arthur D. Little Systems, Inc.; Data General is the common hardware vendor. The sections below review the history and development of the software cooperative, and conditions which influence the abilities of colleges and universities to share software development.

II. HISTORY AND DEVELOPMENT

A. Foundation of MBRCC Software Cooperative

The Massachusetts Board of Regional Community Colleges (MBRCC) has made every effort to develop and implement an efficient and cost-effective computer capacity for all fifteen member colleges. The objective is to provide each college with sufficient computing support to effectively and efficiently meet the identified academic and administrative computing needs of each of the fifteen colleges and the MBRCC.

The need assessment, planning, and equipment procurement process that led to developing the MBRCC Software Cooperative began in 1971. The selected course of action has been tempered by observing the progress of the Massachusetts State College Computer System, established in 1971, which was based upon the then current computer technology. The state college network was designed as a "star-network" with a one central computer center in Boston connected to each campus by remote job entry terminals. The hardware selected was a Control Data Corporation Cyber 72 machine. After reviewing the state college approach, the community college staff determined that a decentralized approach would be more appropriate for the needs of the Massachusetts Community Colleges.

During 1971 and 1972, the Massachusetts Community College System formulated a statewide plan for the development of data processing for the community colleges. The plan, entitled Toward a Plan for Action (Asquino, 1972) was developed by a system-wide committee and recommended that the community colleges take a different approach than the Massachusetts State Colleges. The committee suggested that each of the community colleges should have its own on-campus computing capability as well as a capability for telecommunication with the regional computer center. This approach is a form of distributed data processing that permits both local processing and remote processing with a host computer via telecommunications.

This plan was based upon minicomputers. It was visionary for its time--and minicomputers are just now supporting the types of operating systems, program languages, file handling and accessing capabilities, and communications protocols necessary to implement the plan as described in Toward a Plan of Action.

Since 1974 the Massachusetts community colleges have issued three Requests for Proposals to minicomputer equipment manufacturers. Bids resulting from the first two RFPs were not accepted pending further study. The third RFP, issued in 1977 and based on a study by Farmer (1976), resulted in the award of a MBRCC system-wide contract for minicomputers to the Data General Corporation of Westboro, Massachusetts.

As a result of a 1976 federal grant from the U.S. Office of Education under the Advanced Institutional Development Program, one of the Massachusetts Community Colleges, the North Shore Community College, obtained the means of having Arthur D. Little, Inc., assist it in defining its educational computing needs and strategic alternatives. The needs assessment was made by a college-wide Institutional Development Task Force, comprised of faculty, administrative and support staff supported by Arthur D. Little specialists. After thorough review and discussion, North Shore staff concluded that the college could not afford to develop an information system by themselves. Therefore, the North Shore Task Force recommended the formation of a Software Cooperative with other Massachusetts community colleges that would share in the development of appropriate computing facilities. This recommendation was then reviewed and modified by the other fourteen community colleges during an Invitational Conference held in October, 1977, (Clements and Rodgers, 1977). The revised needs assessment became the basis for the MBRCC Software Cooperative. The MBRCC Software Cooperative was establised on March 30, 1978, by vote of the MBRCC Presidents Council.

B. Implementation of the MBRCC Software Cooperative

A comprehensive plan was developed for the implementation of the MBRCC Software Cooperative. This plan is based upon the commitment to ensure adequate involvement of the intended users of the MBRCC student records system in the priority establishment, design, and implementation processes. This project is being conducted in a two-year timeframe. This schedule is based upon four major phases:

- Phase I: Prepare Strategic Information System Plan;
- Phase II: Develop System Design;
- Phase III: Develop and Test Applications; and
- Phase IV: Install Application at Each Member College.

We have completed Phases I and II, and are currently in Phase III. We are scheduled to complete the integration testing of the student records system at North Shore on or before April 1, 1980. The system will then undergo acceptance testing and warranty testing at another community college and be available for implementation at other colleges beginning summer 1980. This section reviews the progress to date in implementing the MBRCC Software Cooperative.

1) Phase I -- Prepare Strategic Information System Plan

During the summer of 1978, a comprehensive assessment involving 667 members of all fifteen colleges, the Board, and its staff, was made jointly by Arthur D. Little Systems, Inc., and Opinion Research Corporation. The respondents believed that the computing resources should be equally shared for academic and administrative purposes. This assessment established the educational computing needs for academic and administrative purposes. Academic priorities identifed include:

- Seven instructional and research alternatives, of which two were ranked highest:

  - Preparation for use of computers in future careers (i.e., exposure of all students to the use of computers and preparation for computing as a career); and
  - Use of the computer as an information access/ retrieval tool increasing the capability of keeping current with the rapidly expanding body of scientific and other knowledge.

The administrative priorities were determined as follows:

- Administrative database components:
  - Half, or more, of the respondents place an immediate priority on the following types of administrative databases: student, curriculum, personnel/payroll, and financial.
  - For all but facilities and miscellaneous types of data, instantaneous response time are desired.

- The rank order of administrative application programs by level of priority is:
  - Admissions and student records;
  - Financial aid administrations;
  - Financial management applications;
  - Planning, management and institutional research;
  - Library applications;
  - Physical plant operations;
  - Other administrative service applications; and
  - Auxiliary service applications.

Figure 1 presents a definition of the application programs included under each of the above nine areas. (Opinion Research Corporation and Arthur D. Little Systems, 1978).

1. ADMISSIONS AND STUDENT RECORDS

- Affirmative Action Reporting
- Undergraduate Admissions Processing
- High School Testing Records
- Course Master Records (Catalog)
- Schedule of Classes Preparation
- Student Class Scheduling
- Tuition & Fee Assessment
- Student Registration Processing
- Class Rosters
- Term Student Records & Reports
- Course Add/Drop Processing
- Enrollment Reporting
- Enrollment Statistics
- Student Ethnic Group Reporting
- Term Grade Reporting
- Honors Program Records
- Student Transcript Master Records
- Degree Requirements Evaluation
- Correspondence Course Records
- Handicapped Reporting
- Exemption Status Reporting
- Placement & Transfer Records
- Job Placement After Graduation
- Academic Placement After Graduation
- Examination Schedules
- Test Scoring and Analysis

2. FINANCIAL AID ADMINISTRATION

- Veterans Affairs
- Financial Aid Evaluation
- Financial Awards
- Student Employment Records
- Work Study Records
- State Scholarship Program
- National Defense Student Loan
- Work Study Payroll
- Basic Educational Opportunity Grant
- Local Scholarship Awards
- Emergency and Long Term Loans
- Affirmative Action

3. FINANCIAL MANAGEMENT APPLICATIONS

- Trust Fund Accounting
- General Fund Ledger
- General Fund Expenditure Accounting
- Internal Budget Control
- General Accounts Receivable
- Student Accounts Receivable
- Accounts Payable
- Payroll (ALL)
- Employee Benefit Accounting
- Retirement System Accounting
- Bank Account Reconciliation
- Cash Flow Projection
- Investment Records
- Investment Evaluation
- Grant & Contract Administration
- Research Project Accounting
- Research Proposal Monitoring
- Financial Aid Accounting
- Tuition & Fee Accounting
- Inventory Accounting
- Telephone Accounting
- Purchase Order Follow up
- Purchasing Information System
- Vendor Information System

4. PLANNING MANAGEMENT, AND INSTITUTIONAL RESEARCH

- Budget Forecasting
- Budget Preparation
- Budget Analysis
- Budget Position Control
- Institutional Cost Studies
- Faculty Salary Analysis
- Support Staff Salary Analysis
- Faculty Activity Analysis
- Support Staff Activity Analysis
- Induced Course Load Matrix
- Resource Requirements Modeling
- Student Flow Modeling
- Long Range Planning
- Enrollment Forecasting
- HEGIS and Other Standard Reporting
- Data Element Dictionary
- Institutional Coding Structure

5. LIBRARY APPLICATIONS

- Equipment Scheduling (Audio-Visual and Multi-Media)
- Library Acquisitions
- Library Cataloging
- Library Card & Material Preparation & Control
- Library Circulation Control
- Serials Holdings
- Bibliographical Search Service
- Nonstandard Library Material Indexing
- Educational Media Services
- Inter-Library Loan and Services

6. PHYSICAL PLANT APPLICATIONS

- Physical Plant Accounting
- Job Order Account
- Physical Plant Job Scheduling
- Building Maintenance Costs
- Equipment Preventative Maintenance
- Room Key Inventory

7. OTHER ADMINISTRATIVE APPLICATIONS

- Alumni Records
- Foundation and Gift Records
- Curriculum Planning
- Teacher Evaluation
- Teacher Placement
- Student Counseling Records
- Student Psychological Testing
- Athletic Event Ticket System
- Student Activities Listing

8. GENERAL ADMINISTRATIVE SERVICE APPLICATIONS

- Facilities Inventory (Space)
- Facilities Utilization Analysis
- Classroom Utilization Analysis
- Personnel Records
- Personnel Evaluation
- Personnel Placement
- HEW Compliance Reporting
- Staff Ethnic Group Reporting
- Civil Service Position Records
- Consumable Items Inventory (Central Supply)
- Office Machine Repair Control
- Equipment Inventory
- Automobile Registration
- Parking Lot Space Assignment
- Traffic Violations Records
- Crime Reporting
- Car Pool Matching
- Motor Pool Records

9. AUXILIARY SERVICES

- Faculty/Staff Directory
- Student Directory Preparation
- Food Service Menu Planning & Inventory
- Book Store Inventory & Operations
- Off Campus Housing Directory

FIGURE 1 COOPERATIVE FUNCTIONAL APPLICATION PRIORITIES

The system-wide needs assessment has led to the formation of a Ten-Year Automation Plan having as its keynote a software cooperative with a common hardware vendor and a common technical assistance agency (Arthur D. Little Systems, Inc., a, 1979).

The draft MBRCC Ten-Year Automation Plan has been formulated to include the following components:

- Procuring equitable computing capacity for each of the fifteen campuses based upon the Data General ECLIPSE equipment;

- Developing standard database definitions and application software common to all fifteen colleges and MBRCC:
    - Developing and sharing the application programs necessary to permit building, maintaining, and reporting from the database in both on-line and batch modes of processing;
    - Installing the software on each campus, either with their own staff or with the assistance of Arthur D. Little Systems, Inc.;
    - Maintaining the software by themselves or through a system-wide maintenance agreement with Arthur D. Little Systems.

- Recruiting adequate technical personnel for each campus to ensure that the computing resources are well managed; and

- Providing adequate development and training support to the faculty for the use of computers in the instructional programs.

The draft plan has been reviewed by the MBRCC Presidents Council and amended. It will be reviewed by the MBRCC over the next few months with anticipation of its adoption sometime in the Spring of 1980.

2) Phase II - Develop System Design

Phase II had two parts - General Design and Functional Specifications. Phase II - General Design - formulated the general design of the student record system. The objectives of this step were to document the administrative procedures of North Shore Community College, as an example of the administrative procedures used by other Massachusetts community colleges. Next, these procedures were analyzed to determine required data processing support with respect to information input, processing, and reporting requirements. Finally, the databases necessary to accomplish the functions of the administrative procedures were used to define the database for the student records system.

The process of developing the general design at NSCC included a review of the administrative procedures of the college with active participation by the members of the fifteen offices involved in student records processing. The documentation and administrative procedures at North Shore were conducted by Professor Ronald Tagney utilizing a work plan formulated by the staff of Arthur D. Little, Inc. and assisted by Ms. Sherry Gordon of Arthur D. Little. (Tagney, 1978)

If we were designing the student records system for NSCC only, then we could have stopped here. However, all the other Massachusetts community colleges must review the NSCC procedures to determine how the procedures at their colleges differ. The report of Professor Tagney's work was utilized as input into the formulation of a General Design. Arthur D. Little Systems prepared a report for this review. Based upon the review of the General Design report by other Massachusetts community colleges, the general design was modified based upon amendments which were approved by the MBRCC Software Cooperative. The product of this phase was the general design of the student record systems, with approved amendments. (Martin and Rodgers, 1978)

The next step was to define Functional Specifications of the student records system. The objectives of the step were to agree to the following:

- System transaction and work flow narratives;
- Database definition including taxonomies and coding structures;
- Screens and report layouts; and
- An illustrated description of the interactive processing for each transaction detailing what the user does and what, in functional terms, the computer does.

This design was presented in the Functional Specifications of the MBRCC student records system. The process of user input is the review of the Functional Specifications to indicate approval of the Functional Specifications and to make amendments where necessary. Two MBRCC system-wide review meetings were held in March, 1979. The ADLS response to user input is based upon a review of initial functional specifications developed from the general design and approved amendments produced in the previous step. The results of the review of the initial Functional Specifications with approved amendments, formed the approved Functional Specification. These changes were included in the detail design developed in Phase III as described below. There were two products of this phase, initial Functional Specifications, and approved amendments to the Functional Specifications (Rodgers, et al. 1979)

A second component of Phase II system design process was a transfer of technology from Ottawa University, located in Ottawa, Kansas, to North Shore Community College to test the utility of the concepts of the database on-line registration system. This system was developed under partial support by a grant from the U.S. Office of Education by the staff of Ottawa University and utilizing the Data General Eclipse equipment under the Real Time Disc Operating System (RDOS), and in Extended BASIC. After review of the Ottawa system, several modifications were made by the staff of Arthur D. Little Systems. The system was utilized in a parallel operation mode at North Shore in January, 1979. Throughout the spring and summer, North Shore Community College staff worked with the pilot registration system in their efforts to better understand the requirements of converting from a unit record system to an on-line, database system. Several difficulties were encountered, many of which were logistical in nature. After a thorough post-installation testing of the system in the summer of 1978, the North Shore staff decided to discontinue their efforts to convert to the pilot registration system with the intentions of installing the MBRCC student record system in the summer of 1980. NSCC staff will be devoted to preparing for the installation of MBRCC student records system next summer. Many things were learned by NSCC and ADLS from the use of the pilot registration system at NSCC. Notable examples include:

- Clarification of the design of the student records system, including such issues as the structure of the course number system, and the number of individual registrations which a student may have in any one term;
- Clarification of how an on-line system would support North Shore administrative procedures, and the degree to which North Shore administrative procedures merit changing in order to take advantage of the capabilities of an on-line system;
- Necessity to decentralize the data entry and maintenance functions from the computer center staff to the user offices, such as the registrar's office, admissions and financial aid.

North Shore is initiating the installation service for implementation of the MBRCC student record system which is described under the Phase IV installation service described below.

The above steps permitted the fifteen Massachusetts community colleges of the Software Cooperative to agree upon functional specifications for a student records system. The steps have been designed to provide adequate opportunity for communications between and among the various potential users of the student records system and the implementation of the system to meet the identified user needs. The steps were organized to provide a logical, sequential, and inter-dependent process for developing the student records system. The steps begin with the general, or strategic, level and proceed to the very specific and operational level. Three different review processes were included. Each college reviewed the three reports in varying degrees of detail. Collectively, however, there was an adequate review to accomplish the desired goals. A collective concurrence to the design was achieved.

3) Phase III -- Develop Test Application

This phase includes the architectural analysis, detail design, and development of and testing of the applications through integration testing. At the end of this phase, the student records system will be ready for installation at the member colleges.

The architectural analysis and detail design were conducted based upon the functional specification defined in Phase II. The amendments to the functional specification were included in the development of a detailed design which was reflected in a skeleton system of the menus and screens. By coding the menus and screens in a skeleton system (without the ability to enter data), we were able to provide a system review which permits the users to see the system perform before it is actually coded. In addition, the members of another multi-campus system which is joining the software cooperative reviewed the detailed design and made their amendments before the system was actually developed. While completing the detailed design, we were able to conduct architectural analysis which is matching the functional requirements of the student records system to the appropriate technical environment of the Data General ECLIPSE series equipment. Many options for architectural environment were available. The following architectural environment was recommended:

- Data General ECLIPSE equipment, including the C/150, C/330, C/350, and M/600;
- Operating System -- Advanced Operating System (AOS);
- Programming Language -- Interactive COBOL:
- File Handling and Accessing Capabilities -- INFOS, the file handling capabilities of Interactive COBOL, and INFOS QUERY.

Two additional components of the architectural environment, word processing[1] and a higher-level reporting language, require further analysis because commercially available products which operate in the recommended architectural environment are not currently announced. As additional enhancements to the architectural environment are announced each enhancement will be individually evaluated on its own merits relative to improving the functional requirements of the Student Records System and the technical environment required to support those functional requirements.

The details of the architectural analysis and the recommended architectural environment are reviewed in the paper prepared for this CAUSE conference by Gardner and Gauthier (1979).

The development of the system is proceeding in four major cycles; admissions, financial aid, registration, and registrar's processing. As each subsystem is developed it will undergo testing at the subsystem level and then integration testing to make sure that the various subsystems interface correctly. At the end of the four development cycles, the student records system will undergo integration testing. At the end of Phase III, the student records system, with appropriate documentation, will have completed integration testing by ADLS at the North Shore development site.

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[1] Note that Data General announced a word processing capability for the ECLIPSE equipment under AOS on November 9, 1979.

4) Phase IV -- Installation of Application Software at User's Site

During this phase, the application software will first be installed at another user's site. This acceptance and warranty testing is scheduled for April through June of 1980. During this procedure, the test site college will perform the acceptance testing and warranty testing on behalf of the Massachusetts community colleges. It is expected this system will be utilized in parallel operation so that the full capabilities of the system will go through a test similar to an environment in which the system will actually be used. After completion of the testing, the system will be available for installation at other colleges.

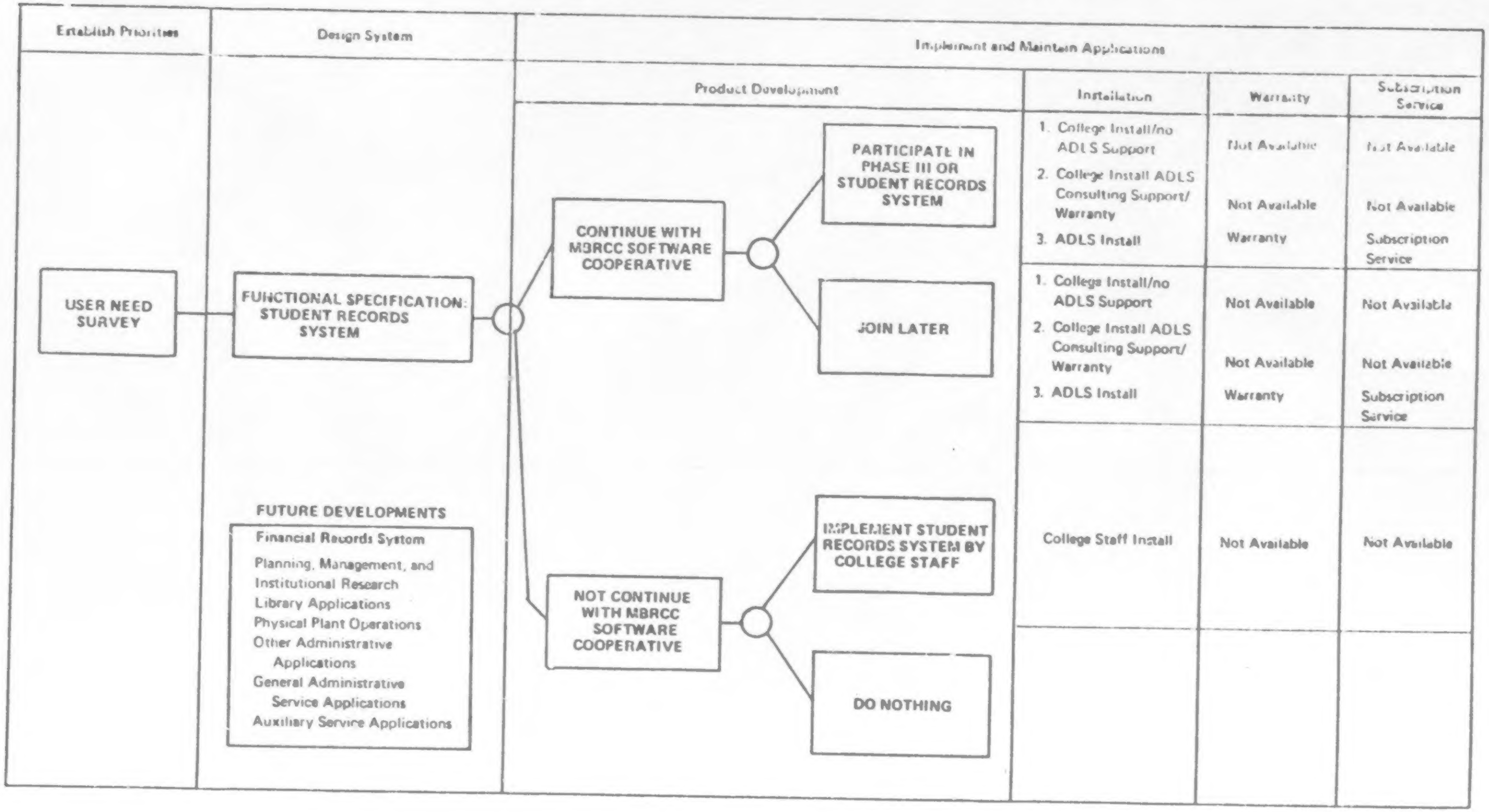
As agreed to at the beginning of the software cooperative, each college would have various options for installing the student records system. Figure 2 presents an overview of the various options a college has during various phases of the system design process. Note that each college has the option at the beginning of Phase III to continue or not to continue with the software cooperative. Of the fifteen Massachusetts community colleges, eight have elected to proceed with the Phase III development. At the end of Phase III, each college then has the option of the following levels of support for installing the system:

- The college may install the system with no support from ADLS;
- The college may install the system with consulting support from ADLS on a best efforts basis; or
- ADLS installs the system and provides warranty and acceptance testing support.

Note also that each of the colleges which has not elected to join at the beginning of Phase III may elect to join later. It was agreed if a college elected to join later they will contribute roughly the same amount to software development as each of the eight participating colleges have contributed in the Phase III development. At that time each college then has the same three options. However, the cost may

FIGURE 2

MBRCC TEN YEAR AUTOMATION PLAN
ALTERNATIVES FOR EACH COLLEGE
TO IMPLEMENT THE IDENTIFIED ADMINISTRATIVE APPLICATION REQUIREMENTS


Establish Priorities
Design System
Implement and Maintain Applications
Product Development
Installation
Warranty
Subscription Service
USER NEED SURVEY
FUNCTIONAL SPECIFICATION: STUDENT RECORDS SYSTEM
CONTINUE WITH MBRCC SOFTWARE COOPERATIVE
PARTICIPATE IN PHASE III OR STUDENT RECORDS SYSTEM
JOIN LATER
NOT CONTINUE WITH MBRCC SOFTWARE COOPERATIVE
IMPLEMENT STUDENT RECORDS SYSTEM BY COLLEGE STAFF
DO NOTHING
FUTURE DEVELOPMENTS
Financial Records System
Planning, Management, and Institutional Research
Library Applications
Physical Plant Operations
Other Administrative Applications
General Administrative Service Applications
Auxiliary Service Applications
1. College Install/no ADLS Support
2. College Install ADLS Consulting Support/ Warranty
3. ADLS Install
Not Available
Not Available
Warranty
Not Available
Not Available
Subscription Service
1. College Install/no ADLS Support
2. College Install ADLS Consulting Support/ Warranty
3. ADLS Install
Not Available
Not Available
Warranty
Not Available
Not Available
Subscription Service
College Staff Install
Not Available
Not Available

entail more design change costs at that time because they would not have participated in the design process involved in Phase III and IV. Note that the subscription maintenance service for maintaining the software is only available if the college elects to install the system through the full installation support agreement.

Installation service for installing the system is defined to provide the service necessary to minimize the disruptive nature of installing a large scale application at a college. The activities are identified in Figure 3 which include the following:

- Continue current procedures;
- Prepare for installation of the new system;
- Install the software applications on the college computer;
- Initiate parallel operations of the new system;
- Complete installation of the new system and end parallel operations.

During this time, the acceptance testing and warranty provisions will have been completed. At that time, the colleges eligible undertake a software subscription service for maintenance of the software or they may elect to maintain the software on their own. This conversion schedule has been developed from the experience at North Shore and the use of the pilot registration system.

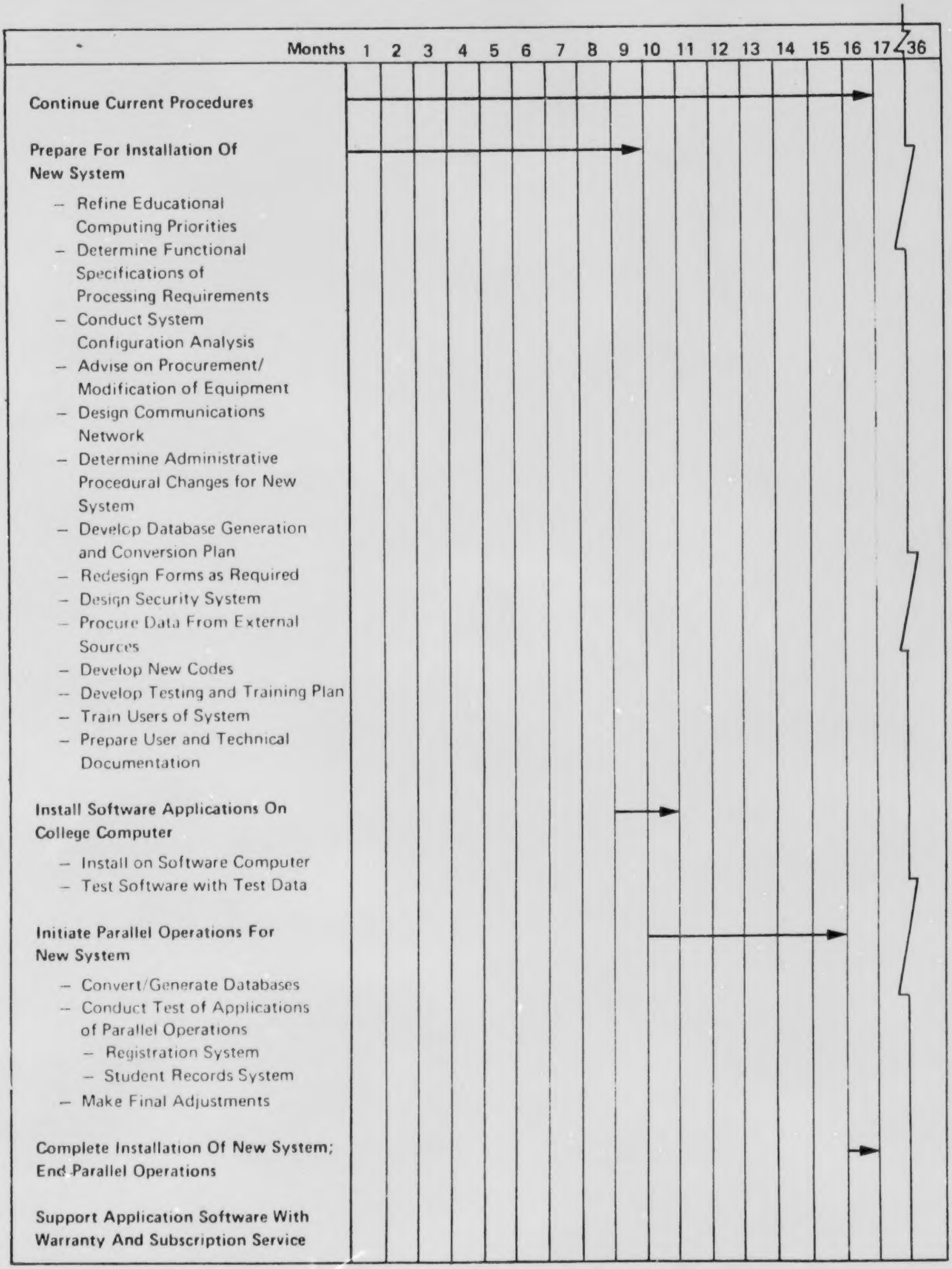
III. Conditions for Cooperative Sharing of Software Development

Stated in broad terms, the mission of any cooperative computing effort is to provide for either:

- Increased computing capabilities at the same or reduced cost;
- The same computing capabilities at the same or reduced cost; or
- Computing capabilities and technical assistance to current and potential members who need it which would not otherwise be able to either acquire or afford such capabilities and assistance.

FIGURE 3

MASSACHUSETTS BOARD OF REGIONAL COMMUNITY COLLEGES
CONVERSION PLAN FOR IMPLEMENTING MBRCC STUDENT RECORDS SYSTEM



To achieve this broad mission, there are certain critical functions essential to the organization of any cooperative computing activity, including:

- A capacity to acquire a stable source of operating revenues, and to allocate those revenues effectively;
- A capacity to marshall capital resources, and to allocate them equitably in accordance with identified needs;
- A systematic ability to continuously monitor the market and technological needs of current and potential members, and to develop services to meet those changing needs, technologies, and intra-structural requirements;
- A capacity to consider systems development and economic trade-offs on a cooperative-wide basis;
- A central capacity to plan realistically over a multi-year period, and a capacity to follow through with those plans into effective action strategies;
- A capacity for maintaining and assuring good two-way communications channels between user groups and service providers, educating them, at the same time providing them support within their parent institutional structures.

Many previous cooperative efforts have been focused upon sharing hardware and affiliated services (Demb, 1975). Notable examples of such cooperative agreements which have been assisted by Arthur D. Little include: OCLC (formerly the Ohio College Library Center); the South Florida Educational Computing Cooperative; the library automation program of the California State University and Colleges. In addition, Arthur D. Little Systems is currently conducting a national evaluation study of the University of Mid-America, a consortium-based approach of eleven mid-western public universities for the development and dissemination of television based open learning systems.

The MBRCC Software Cooperative has been formulated combining the experiences of: 1) the Massachusetts community college system, and the leadership of North Shore Community College; with the previous experiences of the Arthur D. Little Systems staff in planning, implementing and evaluating cooperative computing (and other cooperative technology-based) services. Based upon these experiences, there are several conditions which we believe are important if you wish to undertake a cooperative computing venture. Below we review our current thinking on these conditions. It is important to note that many of these conditions represent ideals to be aspired to, as they have not been effectively achieved in practice either in the MBRCC software cooperative or other cooperatives.

A. Governance

From our experience, the single most critical factor of shared computing is governance. In the MBRCC cooperative, we have elected a governance strategy to resolve conflict, either within a single institution or among the institutions as each attempts to work together to achieve desired common goals. Governance involves a necessary process of team building. Too often the staff brought together for a cooperative computing project understandsthe technical aspects of computing, but give insufficient attention to the emotional and effective aspects required in order to use computers effectively in colleges and universitites. By governance, we mean both the structure and the process for coping with conflict whether it may occur within the college or between and among the colleges. The governance process of the MBRCC software cooperative has been designed to assist in the management and resolution of conflict which quite often arises in cooperative computing ventures. We have not attempted to implement our own version of what the cooperative computing venture ought to be.

There are two basic components of the governance process:

- Peer leadership -- the leadership functions within the group performed by the subordinate members of the cooperative; and
- Organization Climate -- the affect of leadership behavior, especially the behavior of top managers, upon the total cooperative effort (including both within the individual colleges and the colleges collectively as a multi-campus system).

Much of our thinking from the governance processes is derived from the previous experiences of Dr. Traicoff and his work in transactional analysis, the work of Arthur D. Little and Arthur D. Little Systems in cooperative computing ventures, and the research of Rensis Likert and Jane Gibson Likert (1974). Below we discuss each of the components of the governance process.

1) Peer Leadership

The leadership of the Cooperative was delegated by the MBRCC to Dr. George Traicoff, President of North Shore, and Chairman of the Software Cooperative. From the point of view of the entire Massachusetts community college system, therefore, the leadership of the cooperative is at the direction of one of the member colleges and not as a member of the Board office. The Board staff has been most supportive of the cooperative. The peer leadership style includes support not only for the staff of North Shore, but for the staff of other colleges as they voluntarily decide to participate or not participate in the software cooperative activities. Throughout this effort, we have sought to build a team spirit of cooperation by encouraging the staff to work as a team and to exchange opinions and ideas. There is a high goal emphasis in cooperative activities. Everyone is encouraged to devote their best efforts and maintain high standards even when it has been difficult to do so. Where possible, we try to provide help with individuals to accomplish their work as it relates to the cooperative activities. Sufficient help is provided to plan, organize and schedule as well as offering new ideas and solutions to common problems.

Other alternatives for leadership styles have to have the central Board staff mandate a solution. We do not believe that an authoritarian leadership style is effective in achieving the desired results. It is clear that the central staff has to be firmly committed to the cooperative concept, both in spirit and in their willingness to share authority and leadership. Gentle encouragement may be provided by central authorities. However, there are sufficient opportunities for the amount of people who have to be involved in making a cooperative of this nature be successful that any mandated direction can be successfully sabotaged by the staff of the individual colleges.

2) Organizational Climate

Recall that organizational climate is the impact upon the cooperative organization of the leadership style utilized. MBRCC Software Cooperative is a voluntary, self-help, organization within the established organizational framework of the Massachusetts community college system (Schon). Several dimensions of the organizational climate are discussed below:

- Communications -- The communications processes are in all directions downward, upward, and laterally. Accuracy and adequacy of communications is most important while at the same time not attempting to overload the system. The communications process helps make sure that perceptions are as accurate and as close to reality as possible.
- Influence -- All the staff members of the colleges participating in the cooperative have a capacity to exert influence on the cooperative priorities, application designs, and implementation strategies. This is not at the expense of the capacity of superiors to exert influence. All key policy decisions are approved by the President's Council; however, it is most important that the staff of member colleges participating in the cooperative feels they have a capacity to influence this activity.
- Responsibility -- Each staff member of the colleges participating in the cooperative needs to feel a degree of commitment to the cooperative and its goals and displays a responsibility for its success.
- Motivation -- We seek to encourage the members participating in the cooperative to be highly motivated in all ways to achieve established objectives. This is accomplished through building the confidence and trust among the members and between and among the colleges.
- Coordination -- The cooperative provides for effective lateral and vertical coordination through the communications, motivation, and influence channels. Coordination is essential for the

achievement of the long-term goals of a plan as comprehensive as the software cooperative. Many obstacles have to be identified and resolved through the established coordination mechanisms.

- Decision Making -- Problems are detected and addressed in early stages and solved in a manner which is supported by the members of the cooperative. Problem solving is done through a group structure, with ultimate responsibility residing in the Presidents Council. We attempt to have all groups which are affected by a decision to have representation in resolving a decision. Admittedly, group decision-making may take longer than centralized decision-making, but in the long run it produces better decisions. Those who have participated in the decision-making process have greater commitments to following through on the decisions.

B. Management of Technological Innovation

One of the broad missions of any computer cooperative is to develop a systematic ability to continuously monitor the technological needs of current and potential members, and to interpret the implications of technological innovation to meeting those needs. Many computer technologies, as well as other technologies, are constantly changing to the point that few organizations can afford the time, staff, and effort necessary to constantly keep abreast of the variety of technological innovations and to interpret the implications of these innovations to their needs. First, cooperative efforts must establish priorities of member institutions. In the case of the MBRCC Software Cooperative, the priorities were established through a survey in which almost 700 members of the member institutions participated in establishing the priorities for academic and administrative computing. Second, we have had extensive review of the functions to be supported in an administrative area, as well as the concepts to be utilized. These concepts include an integrated, on-line information system using database approaches. Third, we have undertaken a rather extensive architectural analysis in order to determine the match of currently available tools to the functional requirements (Gardner and Gauthier, 1979). For instance, the architectural environment includes operating system, program language, file handling and accessing methods, high level report language, and word processing capabilities. On the Data General Eclipse, the currently available file handling tool is called INFOS, which is a file management tool and not a database management tool. A database management tool is currently under development and those who have observed the development of the ECLIPSE line expect a database management system to be commercially available in a year or two. However, we have made no commitment to immediately implement a database management system. When the system is announced and available, we would then interpret its usefulness and benefits to improving the match of the functional requirements. However, the system-records system is being designed in order to facilitate this conversion, if at some future date, we have determined that it is appropriate. This ability to monitor technological innovations is perhaps one of the greatest assets of the cooperative venture.

C. Ability to Marshall and Allocate Capital and Operating Resources

The MBRCC Software Cooperative has formulated a comprehensive Ten Year Automation Plan. It is estimated this plan will require approximately $6 - $7 million of one-time operating and capital resources. Certainly few multi-campus institutions in the 1980's will be able to attract such resources on a one-time priority basis. Therefore, cooperatives must have some mechanism for attracting and allocating operating and capital resources. A variety of financing conventions are available to accomplish these desired means.

In the case of the MBRCC Software Cooperative, we have established the following conventions. Each of the 15 colleges can voluntarily elect to participate in the software cooperative activities. For instance, all 15 colleges participated in Phases I and II, and eight have elected to participate in Phase III. However, the other seven may elect to participate at some future date by making a contribution to software development equal to that which was make by the other eight colleges that are currently participating in Phase III. In return to this contribution for software development, the colleges gain access to the software in the cooperative inventory. Each college may elect to install the software themselves or, for a fee have the technical assistance agency assist them in installing the software. Capital resources have been derived from a variety of sources to procure the equipment necessary to support the applications being developed by the software cooperative. The Ten Year Automation Plan provides a long term framework to assist the colleges in allocating their limited funds in an effective manner. Without such framework any cooperative effort of this scope could not be undertaken.

IV. Conclusions and Implications

The MBRCC Software Cooperative is making available another option for colleges for development and implementation of a comprehensive information systems. We do not believe that a similar effort has been previously undertaken in American higher education. This is our second paper of the MBRCC Software Cooperative activities (Rodgers and Traicoff, 1978). Delays have been incurred, primarily due to the lack of a stable source of funding. Other difficulties have been encountered and resolved. However, we now believe that by the summer of 1980 we will have successfully installed in one of the Massachusetts community colleges the MBRCC student records system for warranty and acceptance testing. After that time, the efficacy of software cooperative approach will be reported so that other colleges may be able to effectively evaluate this option as one of many options available for meeting the institutions computing requirements.

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INTEGRATING THE INSTITUTIONAL DECISION PROCESS

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The successful college of the future is expected to have a chief executive who spends the majority of his time in external matters, leaving the line officers beneath him to manage the internal operations of the institution. Thus, when proactive decision making will be essential to the pursuit of excellence, and in some cases to sheer survival, a management information officer may continue to emerge as the chief coordinator of the collegiate enterprise on many campuses. This officer serves the institution by identifying, clarifying, informing, and coordinating key institutional decisions. He takes a leadership role in the process of finding a good fit between each decision and the decision process paradigm within which the decision is made. He conceives of the institution as a set of decision systems containing management information subsystems, and he promotes the integration of the inputs and outputs of these decision systems so that the College, as a whole, displays the characteristics of a successful system.

THE MANAGEMENT INFORMATION OFFICER

Every day on every campus in America countless decisions are made. Decisions about going to a class, using the library, joining a campus group, declaring a major, taking or avoiding a certain professor, and decision about marriage, careers, and about whether to return to this college next term. The immensity of this decision grid is mind boggling without even thinking about all the decisions that are made outside the college by legislators, potential students, alumni, donors, and all the other people whose choices taken together determine the external environment of the college.

Most of these decisions are private or individual choices, but many are organizational or corporate decisions. Often called management decisions, corporate decisions are made by people in the fulfillment of their professional responsibility for the institution. Management information systems have been developed in an attempt to assure that these corporate decisions are well informed. Much effort has gone into the effort to develop these information systems and to "integrate" them. However, by its nature, a management information system always remains a set of discrete components which tend to defy integration.

Information systems are in reality subsystems of decision systems, and unlike information systems, decision systems can be integrated. The management information officer of a college is the person with the responsibility of integrating the institutional decision process. He may be called a dean, a vice president of some kind, a systems analyst, a researcher, or a planner, but by whatever title he attempts to integrate the corporate and the private decisions related to the institution in such a way that these decisions affect each other appropriately. If the decision systems of the college are well integrated, the college will move toward the fulfillment of its mission and will serve the welfare of all people involved. If no one has this explicit responsibility, decision integration becomes sporadic and the college gradually loses the characteristics of a successful system.

A college displays a kind of corporate existentialism, and it is what people choose to do that defines and determines who they are as individuals or as an organization. It is to this kind of existential emphasis that Richard Chait (1979) calls us to avoid "mission madness." Chait calls for a better balance between effort expended on normative mission statements and effort expended in the simple pursuit of academic excellence. He suggests finding out what you can do well and allowing that success to influence your mission. A mission statement thus becomes an expression of what the college believes it can do well. The decisions and subsequent actions of all the people associated with the college do define and determine the nature and success of the institution.

However, since no decision is made in a vacuum, since people are free to choose only from the options they perceive open to them, a college creates a collective life of its own and powerfully influences the choices of the people who associate with it. Colleges will have to continue developing their information systems, but the larger more comprehensive frame of reference is decision systems.

A system is a set of elements and activities which work together to convert inputs into outputs. An organization must integrate the inputs and outputs of its various systems to achieve its mission and goals. The input to a decision system is a decision, and the output is also a decision. The energy that drives the system is information, mostly about decisions. It is truly a decision system with an information subsystem.

Because any system is a construct, a system does not exist in the same way that a tree exists. A system exists more in the way that a forest exists. The role of the management information officer is to identify the key decisions which the college must face, and to structure them as understandable system events. In developing a useful system construct, the management information officer focuses appropriate organizational attention and information on the key decisions. He helps the organization clarify who is deciding what, when the decision will be made, and how it will be made.

The key institutional decisions may be operational or tactical, but they tend to be strategic decisions.

Strategic decisions tend to be non-recurring, and to be issues which require resolution based on both good information and value laden judgments. A more troublesome characteristic of strategic decisions is that they are often only vaguely defined when first noticed. Indeed it is common for the members of the top administrative team not to agree on which strategic decisions need to be made. How easy it is to just let things take their course, allowing the institution to suffer increasing inefficiencies until what would have been a strategic decision becomes an emergency decision.

Several factors have been converging to create the need for a management information officer who does not make the key corporate decisions, but who is aggressively and significantly involved in identifying, clarifying, informing, and coordinating the key institutional decisions. If it did not make him sound like a de facto president, he could well be called the management decision officer of the institution.

One important change in college decision making was signaled by Rourke and Brooks (1966) when they focused on the increasingly open nature of college administration. Everyone on campus has access to the same information. Faculty committees commonly have students on them, and faculty and student representatives often sit with the administration or the trustees.

Less obvious than this move to open administration, but perhaps even more significant to the institutional decision process has been the ongoing evolution of the presidency itself. The president of a successful college will probably be spending more than half, and in many cases more than 75% of his time in various external matters, from rotating with the Rotary to laughing with the legislators and dining with the donors. Of necessity, the president has delegated the management of the organization to the members of his cabinet. Each of these line officers has a specific but limited scope of authority in the institution.

With these changes in decision making patterns, with the president primarily preoccupied with external relations, with line officers appropriately concentrating on their own areas of responsibility in the institution, and with the external environment changing incessantly, strategic institutional decisions can easily go unnoticed until it is too late. Every organization must have some adequate means of determining whether that small cloud on the horizon is friend or foe and, in either case, what should be done about it. The management information officer keeps the institutional focus on those little clouds until an appropriate and timely response has been made.

DECISION PARADIGMS

Every corporate decision has a process. The management information officer seeks a good fit between each decision and the process by which it is made. In his explanation of the nature of scientific revolutions, Kuhn (1962) explains a paradigm. More powerful than simple rules, a paradigm is a substratum model with implicit assumptions which powerfully control the outcome of the activity which is set on that paradigm. A process, procedure, or definition which might be appropriate on one paradigm could be wrong on some other paradigm. Good corporate decision making in the collegiate context depends on a good match between the decision type and the decision process paradigm which is adopted by those who are involved in making the decision.

The decision paradigm or model is constructed from at least four different types of components.

1. The decisions involved are either private or corporate.

2. Whether the decisions are private or corporate, they will normally relate to one of the three common categories of corporate decision making:

   a. Operational decisions which are made in conformity to established patterns for recurring activity.

   b. Tactical decisions which require some judgment to allow an objective or standard to be met.

   c. Strategic decisions which set the institutional goals and standards, as well as the broad policies within which they will be pursued.

3. An organizational model must be assumed. Millet (1978) has identified five organizational models that are commonly used in trying to analyze higher education institutions. Each model explains some phenomena better than it does others, and each is probably applicable in every college for one decision or another. The very existence of five models implies that we are dealing with a very complex creature which has as many faces as a Picasso statue.

a. The dual organization model gives academic decisions to the faculty and all other decisions to the president.

b. The collegial or academic community model assumes the ability of faculty and other identifiable interest groups to achieve an adequate resolution of their differences and a working consensus.

c. The political model assumes that compromise rather than consensus is the most common means of resolving conflicting interests and values.

d. The bureaucratic model emphasizes a functional hierarchy with several layers of rules and rule enforcers.

e. The organized anarchy model describes colleges as unsure of their means as well as their ends, with a highly transient population prepared to promote and take advantage of disorder in the pursuit of their personal goals.

The organizational model that is assumed in constructing the total decision process paradigm strongly influences who will contribute what to the final decision. In some cases those people most affected by the decision might have the least control over its final disposition. In other matters, those most affected would be the only ones involved. Paradigm construction on this particular variable is supremely important and this variable is understandably the source of the most intense confrontations as a college seeks to make its key decisions. Frederickson (1978), writing as the President of Eastern Washington State University, considers the current "hard times" in American higher education to be a short-term phenomenon requiring especially broad participative decision making processes focused on short-term actions. In contrast to this approach, many colleges are placing renewed emphasis on very long-range planning.

4. The organizational model which is assumed relates directly to the issue of who will contribute what to the decision. Three broad categories cover most of the situations.

   a. Hierarchical or autocratic - Any person or group, such as the trustees, the president, some outside person or group, or a faculty committee, may be empowered to make the final decision.

   b. Consultative - Whoever is empowered to decide must give all interested parties an appropriate opportunity to influence the final decision by whatever non-coercive means of persuasion are considered acceptable.

   c. Participative or democratic - Whoever is a member of the community and especially whoever is most affected by the decision has the right to make the final decision.

Ultimately, decision paradigms are always locally defined, so this framework is only a generalization about the construction of the most appropriate decision process paradigm for each situation. A decision paradigm could be any combination of components from these four areas.

KEY DECISIONS

American colleges are typically centers of stability and tradition in the midst of the rapid social change which has characterized the 20th Century. According to Jack Lindquist, a college will normally defend the status quo of its programs, personnel, and practices. Such an institution will "seldom alter its functions without external influence." (Lindquist, 1978, page 28.) Partly because it is not a change oriented institution, a college will commonly find that its key decisions involve coping with significant change, often induced by some external influence. When a key decision springs from such an environmental factor, the management information officer has the difficult assignment of helping a status quo faculty deal with change which they would probably rather not even think about. In other words, key decisions tend to require responsiveness in an organization that is primarily oriented toward stability.

A second important characteristic of key decisions is that they are not obvious to everyone. In fact, key decisions are sometimes not obvious to anyone, and if left to develop through normal processes, they often become emergencies. A college can benefit greatly from the service of someone who systematically looks for both big problems and big opportunities. This same person very naturally functions as the institutional collection point for suggestions from faculty, staff, and students about key decisions. This officer can provide an early alert, insistent reminders, and coordination.

The areas where the management information officer will regularly hunt for key decisions that are starting to take shape include marketing information, environmental assumptions, and the findings of the institution's accountability research activity.

1. Marketing Information

Marketing is the systematic cultivation of exchanges of value. In college marketing, only some of the exchanges involve money. Status, fun, security, respectability, hope, novelty, SAT scores, degrees, friendships, and knowledge are only a few of the myriad items with exchange potential between a college and its publics. The successful college needs a selected marketing data base with up-to-date information about those particular college publics with whom exchanges should be cultivated. The emphasis of marketing is on organizational responsiveness. If the institution is determined to "do its own thing" no matter what, then marketing is inappropriate. The college will simply try to sell itself to potential donors and students. In contrast to selling, true marketing assumes that neither the product line nor the buyer is static.

The information provided from a good marketing data base is an important source of key decisions which the institution will need to make.

2. Environmental Assumptions

Marketing works with publics that can be cultivated. Environmental assumptions involve forces or factors over which the college has virtually no control. These assumptions are developed mainly in the categories of demographic, economic, political, or broad social factors. Inflation, average SAT scores of graduating seniors, the national birth rate, and the declining dollar value of a higher education are factors beyond the direct control of most colleges. All a college can do about such environmental factors is adapt to them. The management information officer guides and coordinates the institutional effort to identify those environmental assumptions with the greatest potential to impact the college.

3. Accountability Information

Under the broad title of accountability, a college should include all those self-study activities by which it seeks to determine whether it is in fact what it claims to be. This goes beyond ethical honesty in advertising, to examine the satisfaction and success of the students, faculty, staff, and alumni of the institution. If college in general, and any one college in particular, really does make a difference, ethical accountability requires that data be gathered to back up the college's public claim about itself to either students or donors.

The college should have some systematic means of surveying alumni. The interest of donors and potential donors, both corporate and individual, must be monitored. The campus climate should be regularly assessed, looking for signs of value shifts. Cost/benefit analyses must be conducted and systematic program evaluation is unavoidable. The college must have access to a simulator that can project ten or more years into the future various models of the institution.

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Key decisions can emerge from any one of these areas of information about the college or its environment, but perhaps the most difficult issues that will arise are those involving the conflict between the need to adjust academic programming and the resistance of a tenured faculty to such changes. The most traumatic decisions are usually those about adding or dropping programs or personnel, but these choices can be made, and successful colleges are figuring out their own best ways of doing it. Clarification of the decision paradigm in these instances is critical. A witch hunt for wounded programs or marginal teachers will only serve to demoralize or enrage the faculty, and in some cases college administration have managed to do both. A clearly understood systematic process of summatively reviewing all programs and personnel will go far to assure that the results are neither unexpected nor arbitrary. Most small colleges are strongly teaching oriented, as opposed to research and publication, and the faculty of such institutions will often accept the wisdom of adding "productive classroom teaching" to the criteria used in continuing or dropping either a tenured professor or an entire program.

In a small college, one bad teacher hurts a lot more than he does in a large institution, and decisions about dying programs or dead teachers are truly key decisions that the management information officer and the academic administrators must address together with all the wisdom and courage they can muster.

UNOBTRUSIVE LEADERSHIP

Martha and Richard Gilliland (1978) suggest from general systems theory that if good decisions are being made, a college, viewed as a system, will demonstrate the following characteristics:

1. Orderliness, that is, outcomes are predictable
2. A good balance between stability and responsiveness
3. The ability to maximize work with available resources
4. The ability to obtain more resources

The effective integration of the inputs and outputs of the decision system within the college are the keys to achieving these characteristics of success. A college commonly places an officer in charge of just about everything except its own decision making.

The management information officer of a college emerges as the locus of a special kind of unobtrusive leadership within the organization. He coordinates and informs the entire institutional decision process, while carefully avoiding making the decisions themselves. He effectively becomes a leader in the organization while not appearing to lead in the traditional sense. He brings orderly integration to the ongoing decision making of the institution by providing clear images of its options, by bringing a vague and distant future into close focus, by providing the information on which the key decisions are based, by helping the college decide which key decisions need to be made, and by clarifying the process paradigm which is most appropriate for each decision.

This officer will be blamed when things go wrong and forgotten when choices turn out well, but if he has the strength and skills to do it, he can serve his college as both prophet and judge. By being a true servant of the institution, he truly becomes one of its leaders.

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THE INFORMATION SYSTEM OF THE 1980's

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The conditions to be faced by higher education in the 1980's include:

1. income loss due to enrollment decline,
2. systematic review of academic and non-academic programs,
3. cost containment and
4. the relationship between institutional and statewide planning.

These conditions will cause colleges and universities to prepare themselves for the management of change and/or the management of reduced scale. This effort will require new relationships to be formed between data providers and policy makers at all levels.

Dr. Millett discusses these conditions from his vantage point at the Academy of Educational Development (AED).

THE INFORMATION SYSTEM
OF THE 1980S

A Paper Prepared For
The 1979 CAUSE National Conference
Orlando, Florida
November 29, 1979

by

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In this final paper of Track IV devoted to Small College Information Systems, I am supposed to review and comment about seven earlier papers presented to you. As is almost always the case, the review and comment I have to offer will be highly general, not critical, and only occasionally related to any of these papers. I learned a long time ago that in planning a program the planner might assign the desired topics but the speaker might or might not pay any attention to the assignment. On many occasions I have observed how remote indeed was the speaker's content from the planner's intention. I wouldn't want to spoil that record here.

In fact, I found all seven papers informative and useful. I found almost nothing with which I wanted to quarrel and a great deal with which I wanted to agree. For example, I noted the observation that the presidents of colleges would in the future devote about 75 percent of their time to external affairs and would devote the

25 percent of his or her time within the college to being briefed about what was happening, to making campus appearances, and to determining a few critical choices. I must say that I agree completely with this assessment of presidential performance, and I believe that many colleges and universities have not yet come to grips with either the organizational or the informational needs of this circumstance.

At the outset of these remarks let me say something about the small college as an organizational arrangement. I think small size will become a critical issue in the 1980s, and one of the challenges of an information system will be the development of an academic alert on this very subject of size. In its 1973 final report, the Carnegie Commission on Higher Education brought up again the question of enrollment size. In identifying seven "priority" issues for action in the years ahead, the Carnegie Commission included the issue of preserving and enhancing quality and diversity in higher education. A major item in this concern was the question of effective size. The Commission expressed the belief that some campuses were too small to have a well-rounded academic program for their students, and that other campuses where too large to have a sense of cohesion and effective governance.

The Carnegie Commission suggested "peril points" below which and above which campuses should be concerned as to whether or not their quality of effort was being impeded by being either too small or too large. The Commission fixed the minimum FTE enrollment "peril points" as follows:

A comprehensive university	5,000
A liberal arts college	1,000
A community college	2,000

One may argue about these minimum desirable enrollment sizes. I must report that in my own administrative experience and in my own consulting activity I have found substantial evidence to suggest that these minimas are realistic and are not to be ignored with impunity.

Recently, I had occasion to put together some enrollment data based upon the 1976 report of the Carnegie Council on Policy Studies in Higher Education setting forth a revised classification structure for individual campuses. I found the average size of private comprehensive universities to be 3,300 students rather than 5,000, and I found the average size of private liberal arts colleges to be 900 students rather than 1,000. Moreover, I made a special analysis of the 572 private liberal arts colleges as listed in this Carnegie report and I found that 357 of them, or 62 percent, had enrollments of under 1,000 students.

My own concern with enrollment size has more to do with costs than with a well-rounded academic program of quality. Now, do not misunderstand me. I am not saying that I have no concern with the quality of student instruction on a campus. I have a very real concern with quality, and I believe that there is a quantitative enrollment and ~~faculty~~ faculty dimension to instructional quality. I am inclined to believe that an academic department in the arts and sciences cannot offer a quality major course of study to a student at the baccalaureate level with fewer than four faculty members in the department. If a college can afford the requisite faculty strength in a discipline, quality standards can probably be maintained regardless of enrollment size.

My concern on costs has to do with the distribution of expenditures between output programs and support programs. Making use of the standard chart of accounts recommended in Part 5 of the manual on College and University Business Administration published by the National Association of College and University Business Officers, I find it very important for analytical purposes to divide the major program categories for budgeting and accounting purposes into two groups, which I label ouptut programs and support programs. The output programs include instruction, research, public service, and scholarships and fellowships. I would prefer to label this fourth program category as student financial assistance. The support programs are academic support, student services, institutional support or institutional administration, operation and maintenance of plant, and transfers of educational and general income.

Please note that I omit from this analysis certain other program categories in the recommended chart of accounts: auxiliary enterprises, hospitals, and independent operations. These program categories present some special problems of analysis, and I do not wish to complicate this discussion by any reference to these particualr program areas of both income and expenditure.

My analytical concern is with the proportion of the current operating expenditure budget devoted to these two program groupings: output programs and support programs. In the work I do today I find on all college and university campus a rising proportion of the expenditure budget going to support programs. I argue that the peril point in this relationship is 50 percent. When the support budget requires 50 percent or more of the total current expenditure budget, then I question the continued economic and financial viability of a particular campus. And I find that as enrollment size diminishes the proportion of the expenditure budget committed to support costs tends to rise.

I do not wish to belabor this concern here, although I believe the concern to be real and threatening. I do wish to suggest that in our information analysis we need to give special attention to the relationship of output costs to support costs. And I do wish to suggest that all of us in higher education need to give some imaginative and innovative thinking to the question of how to contain support costs within the small college. Unless we have an answer to this question, we shall have many fewer small colleges to worry about in 1990 than we will have in 1980.

The second major matter I wish to comment about has to do with the management part of a management information system. I take it that no one in a CAUSE national conference has to be converted to accept the importance of a management information system to a college or university, large or small. Out presence here signifies our commitment to information processing and analysis as an indispensable tool of rational behavior within the academic community.

The important factor in a management information system is not information but management. As I have read the papers to which you have listened yesterday and today, I preceive a constant attention to management. We are informed that a planning agenda is necessary to achievement of a university mission, and that faculty and administrators have joined together to plan future program efforts. We are informed that information is essential to a planning, management, and evaluation system. We are informed that an effort at management by objectives has required comprehensive data bout personnel, programs, and income and expenditures. All these reports about institutional experience emphasize the management ingredient in information systems.

This audience does not need to be reminded that information is a means to an end. The end is rational planning, rational decision making, rational work performance in accordance with approved plans and approved budgets. Planning is a function of management and campus leadership. Decision making is a function of leadership and governance, including consultation with representatives of the principal constituent groups of the academic community including faculty and students. Work performance is management in action. A leading manufacturer of computer hardware continually tells us by means of television that it is in the business of putting information to work for people. In our academic communities we are in the business of putting information to work in the cause of higher education improvement and advancement.

A short time ago I tried my hand at preparing a document entitled "Essentials of Management Information." My objective was to outline from the perspective of 30 years of experience as a researcher, administrator, and consultant what management of a college or university needs to know for meaningful planning and for effective work performance. It is a challenging task, and one I recommend strongly for all higher education managers and leaders.

I share with you the results of my efforts not because I consider the results to set a standard for others to adopt but because I consider the results to suggest a process of thought vital to information utility.

I began my efforts by thinking about the basic requirements of an effective and efficient management information system. I decided that the requisite characteristics of a management information were these:

- Comprehensive in scope
- Adequate for various uses
- Accurate
- Timely
- Comparable
- Useful
- Acceptable

Secondly, I asked myself what kinds of information were needed in a college or university. I decided there was a need for at least five kinds of information:

- Operational Data
- Statistical data
- Planning and budget data
- Evaluative data
- Simulation or projective data

Thirdly, I thought a good deal about the essential data base for a college or university information system, and I decided that all information processes and all information reporting should be built around the program performance of each individual campus in our higher education system. A program classification structure is an essential for a campus if the data base is to be organized around programs. Such a structure was first published by NCHEMS in 1972 and revised in 1978. The NACUBO chart of accounts is also a program classification structure. There are discrepancies between the two structures, and there are some obvious misclassifications in both structures, in my judgment. Moreover, the instructional program taxonomy of 1970 is not an adequate classification scheme for instructional programs. The result was that I had to undertake to develop a modified program classification structure, making use of features from both the NCHEMS and the NACUBO structures, with minor modifications.

In this connection it is important to emphasize that a program classification structure and a chart of accounts which are mutually compatible and supportive are indispensable in a management information system. Just as planning and budgeting must be closely linked in a management system, so planning data and budget data must be linked in a management information system. This linkage can be achieved only if the budget and accounting centers of a campus organization are also the planning and information center.

In the fourth place, I undertook to develop a comprehensive structure of management information system for a campus. I decided that the principal parts of this information structure should be as follows:

- Recruitment and admissions data
- Student financial assistance data
- Student enrollment data
- Degrees awarded data
- Staffing data
- Facilities data
- Expenditure data by program and by object
- Income data by major sources

In the fifth place, I gave some thought to the principal kinds of analytical data which might be useful for management planning and governance decision making. I decided to give primary attention to the direct costs of instructional programs, to total cost of instructional programs (including an equitable allocation of support or overhead costs), and to a technique I have developed which I label "component budgeting."

I have presented here of course an outline. It is not possible to include mention of all the details which went into the elaboration of these various parts. Obviously it is not enough to specify the major components of a management information system. It is even more important to set forth the details of desired information, and then to give some stability to the whole information process.

I dwell upon this effort to set forth essentials of a management information system because I believe the effort itself may be worth careful consideration. I have no illusions that my particular results are necessarily the particular results which others will reach. I do believe that the process of thought which went into the development of an effort to set forth essentials of management information system represents a necessary process which must be undertaken campus by campus.

I recognize that the essentials of a management information system which I undertook to develop may appear to be too rich for the income circumstances of many small colleges. And I recognize that the public college campus is frequently a part of a much larger multi-campus governing structure, and often part of a state-wide planning and coordination system. The small college must arrange its management information system to fit the realities of its size and its budget. The public college must arrange its management information system to fit the realities of its governance structure and its status within state government.

Nonetheless, a management information system doesn't need to be expensive. Even with the declining costs of electronic data processing today the computer may not be the answer for information processing on a campus. The basic ingredient of a management information system is information, not a computer. Data must be collected, processed, and analyzed in the most cost effective procedure suitable to the circumstances of a particular campus. What a college or university cannot afford to do is to be without information.

Finally, let me share with you a few observations about the changed environment of planning within which a management information system must operate today on a college campus. One of the ironies of our day is the bad repute of planning within higher education as we enter the decade of the 1980s. Of all institutions in our society, higher education is dedicated more than any other to the encouragement and development of rational thought and rational behavior on the part of man. But already we are witnessing that the community of academic man is scarcely rational as it confronts a threatening future.

I shall not dwell here upon all the environmental changes which in turn influence the need for change on our various campuses. Elsewhere I have posed the management problem of the 1980s for higher education as the management of change or the management of reduced scale. In many instances the choice is not an either/or proposition. The campus which does not manage change may well find that it may have to manage reduced scale on a substantial basis. But the campus which does manage change successfully may still have to manage reduced scale in various programs.

The role of management information in the management of change and in the management of reduced scale is a limited role. Information cannot produce miracles, or change the external environment of higher education. More extensive, more accurate, more timely information will not make the planning job of managers any easier, or the decision-making job of leadership and governance any less troublesome. The role of information is to inform managers, leaders, and governing bodies. The role of information is not to substitute for managers, leaders, and governing bodies.

I am very fond of quoting a statement which has appeared in many advertisements of a leading American manufacturing company in the past three years. The statement reads: "There are no easy solutions;

only intelligent choices." In higher education during the 1980s there will be no easy solutions. There will be only intelligent choices.

There will be managers, leaders, and others who currently and in the years ahead will say that they have inadequate information about operation of their particular college or university. And in some instances the complaint will be justified. Many colleges and universities have still not identified the management information they need, and have still not designed and implemented a comprehensive management information system. There is still much to be accomplished in establishing a data base, in reporting data about current operations, and in analyzing trends and problem areas.

But the absence of the data we need for informed planning and informed decision making should not become an excuse for an absence of planning, or for a posponement of decisions. The task of management is to make intelligent plans today rather than to wait until tomorrow for some perfect plan. The tomorrow of a perfect plan is not likely to arrive.

Let me also caution against a confusion in available information. We can know anything we wish to take the time and effort to find out about our own internal operations: the programs we offer, the enrollment we serve, the staffing we employ, the facilities we use, the income we obtain, and the expenditure patterns we follow. Our internal operations can and should be an open book.

But there is much we don't know and can't learn about our external environment. We know demographic trends of the past decades and we can project demographic expectations, but we don't know whether or not the current birth rates are likely to change in the 1980s and the 1990s. We know the economic trends of the past 35 years since the end of World War II, and some econometrists dare make projections of economic growth, employment, foreign trade, median family income, income distribution, and inflation in the years ahead. But we don't know the future of energy resources, material supplies, available technologies, labor market supply and demand, environmental pollution, and economic growth potential. We know the governmental trends of the past 35 years, and more particularly we know how those trends have influenced the operation of our colleges and universities. But anyone who today will predict the political events of 1980 let along the political events of the decade of the 1980s should have his power of prophecy questioned.

We need to make a distinction, a very careful distinction I believe, between management information in higher education about our internal operation and management information about the external environment of higher education. For example, we can report and analyze our recruitment and admissions experience as well as our enrollment experience. But how can we know with any precision the number of admission inquiries we shall have five years from now, the number of completed admission applications we shall receive five years from now, the number of students (first time and returning) we shall enroll five years from now. We can make reasonable projections of past experience; we have trouble when we endeavor to forecast actual experience based upon the demography, social expectations, economic performance, and political actions five years ahead.

These cautions of mine are not criticisms of planning, of managers, or of management information. These cautions are simply reminders that chance and luck still influence the destiny of enterprises. And I would add that we should be alert to the fact that individual leaders can and do make a difference in society, in the economy, in the polity, and yes, in colleges and universities.

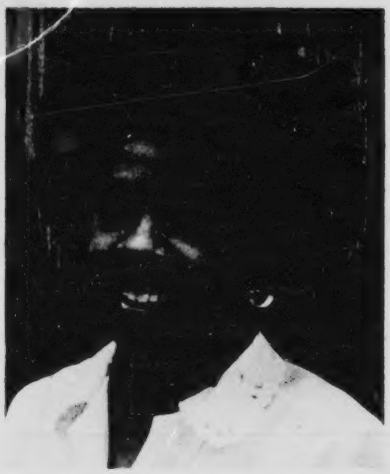
The managers of information make a difference too. In organizational terms, I envisage that offices of institutional research on various campuses will be replaced by offices of management information. And I cannot envisage a campus planning process which is not integrally related to a management information system. The availability of data, the sophistication and sensitivity of data analysis, the posing of critical issues--these responsibilities are burdens, challenges, and opportunities for the management information officer.

I repeat: There are no simple solutions to the problems of higher education in the 1980s. The small college in particular confronts problems of particular complexity. For these problems we must explore intelligent choices, and then we must make reasoned decisions. I hold there can be no intelligent choices and no reasoned decisions without management information. Intelligent choices are informed choices. Reasoned decisions are informed decisions. Small colleges--indeed, all colleges and universities--are dependent upon knowledge about themselves. Let us hope that for higher education as for society, knowledge will be power, the power to chart and pursue rational behavior, and the general welfare.

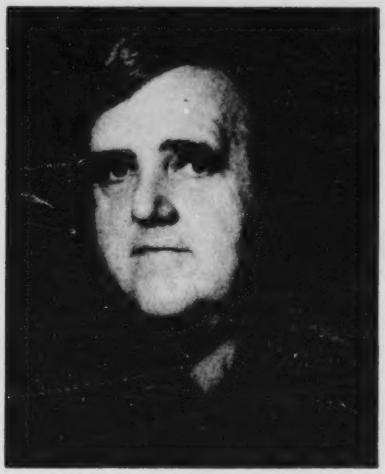
TRACK V
VENDOR PRESENTATIONS

Coordinators:

Nellie Hardy
University of Arkansas at Pine Bluff



Bill D. Morris
University of Central Florida



John J. Woolley
Systems and Computer Technology

Robert Briggs
Pansophic Systems, Inc.

Ron Mullenaux
Informatics, Inc.

MSA
THE FINANCIAL SOFTWARE COMPANY

THE MSA APPROACH

Management Science America, Inc. designs, programs, documents, installs and supports a series of financial and human resource application systems. These systems, along with the support and continuing enhancement and maintenance services provided by MSA are termed "software packages" within the industry. Each package is designed with options and "parameter flexibility" so that it can be utilized in a multitude of companies, industries and computer operating environments.

This philosophy of software development enables MSA to devote design and programming resources to continue enhancement of generalized packages, without having to devote a large percentage of resources to the support of existing customers. On the other hand, customers receive enhanced systems as they are developed by MSA as part of an on-going maintenance service.

Rather than "customize" the packages for each individual installation, MSA is able to quickly install the software system on a customer's equipment. The installation then proceeds with MSA technical representatives who train user personnel in the use of the system and assist with special problems, questions and choice of alternatives during the implementation process.

The major benefit of this approach is that your personnel are thoroughly familiar with the installation, operation and use of the system. Therefore, they are easily able to maintain the system, change parameters, options and other data which control its operation to compensate for changes in reporting requirements, organizational structure, and other changes in the environment.

Extensive documentation written specifically for the using department, as well as the System, Programming and Operations Departments accompanies each each system. This documentation, containing numerous examples and illustrations, aids in training employees who are using the system for the first time. Programmed training workbooks and tape cassettes can be used initially and to train new employees.

This program of continued enhancement, software warranty and maintenance insures that users of MSA systems will continue to have the most current, up-to-date system from both a data processing and application standpoint. It is the major factor which sets an MSA "package" apart from inhouse developed or other "custom" software systems.

Another great advantage is the fact that the system can be installed much more quickly than one which must be partially designed, coded and tested. The overall implementation timeframe (and cost) can be shortened significantly by allowing accounting users to "get involved" in the system more quickly.

MSA
THE FINANCIAL SOFTWARE COMPANY

The MSA General Ledger System offers many advantages to colleges and universities such as:

- The ability to account for Grants utilizing a fiscal year differing from the institutions.
- User controlled reports by responsibility structure as well as by fund.
- The ability to change functional or organizational structure without opening and closing accounts.
- The ability to produce all user defined reports with one pass of the General Ledger Master File.
- The ability to allocate indirect costs on selected statistical bases for calculation of indirect cost rates for grant administration.
- On line edit and inquiry capabilities.
- The calculation of available funds for any budget category or account is updated with each online or batch entry to the General Ledger.
- The ability to user a user defined algorithm against current and historical financial and statistical data to provide an initial budget document.

MSA offers a set of systems that can be implemented separately but that can also function as a single unit. They are an integrated financial management system.

Human Resources
- Payroll
- Personnel
  - Position Control
  - Employee Benefits
  - Life to Date History
  - Lost Time/Health & Safety
  - Applicant Flow
  - Career Development
  - Labor Relations

Cash Management
- Accounts Receivable
- Accounts Payable
- Supplies Inventory Control and Purchasing

Financial Reporting and Forecasting
- Fixed Assets (Property Control)
- General Ledger
- Financial Forecasting and Modeling

MSA offers integrated, user controlled and constantly enhanced systems that can be quickly implemented.

For more information on how these systems can function in your institution call or write Jon Gearhart at Management Science America, Inc., 3445 Peachtree Road, N.E., Atlanta, Georgia 30326 or (404) 262-2376.

informatics inc
21050 Vanowen Street
Canoga Park, California 91304
(213) 887-9121 Telex 69-8715
Cable INFORMATIC

Implementation Systems: Software for the Eighties

Key software challenges of the Eighties include:

1) Continuing critical shortage of software personnel for application development.
2) Increasingly complex software environment due to growth of data base technology.
3) Capitalizing on the investment in DBMS.
4) Placing answers where the problems occur.
5) Putting user-friendly Implementation Systems tools in the hands of end-users.

Programmer productivity will continue to be a key issue. Hardware performance has increased 200% in ten years, while programmer productivity has increased only 4% during the same period. Fifty-one percent of the average data processing budget is now paid out for people. Colleges and training schools can't keep up with the demand for trained professionals. Turnover in the average computer installation is about 28% per year; at that rate, one-half the current employees in an installation won't be there two years from now.

The software environment is growing more complex. Fifty percent of hardware dollars are now going into communication equipment; software to support this equipment is continually being developed. Application programs are becoming more sophisticated and difficult because they must interface with Data Base Management Systems and Data Communication Systems. The life cycle of applications is shorter as both the operational environment and technology changes more rapidly. Even though technology has reduced the price of hardware, the total amount spent is not reduced because more hardware is being purchased. Since management is demanding more comprehensive applications, more applications must be written from the current level of people expenditures.

Software is difficult to design and implement. Managing and controlling the development cycle is a skill (art) mastered by all too few. The maintenance requirement for existing systems has escalated to 67% of the total life cycle cost for applications according to an ACM computing survey (June, 1978). Procedural languages are inadequate; structured techniques can help only up to a point; beyond that, new methodologies are needed. The solutions lie in better management techniques and new software approaches. Management techniques (including management by objectives and sophisticated project control) have been addressed extensively by experts in the last few years.

(more)

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Implementation Systems:
Software for the Eighties

New approaches in the form of non-procedural languages are the greatest hope for maximizing productivity and minimizing response time to user needs in the Eighties.

Informatics offers Implementation Systems—software tools for Data Base Inquiry, Report Writing, and Application Development. These are used by both Data Processing Professionals and non-technical users to get the job done quickly and successfully.

Data Base Inquiry tools allow non-technical users to interrogate on-line data bases and immediately display the results. INQUIRY IV/IMS is a completely interactive Inquiry System for data bases on-line under IMS Data Communications. The Data Base Administrator can tailor the capabilities and functions of the product to the needs of each authorized user. The user can immediately display information at a terminal without using the time of expensive Data Processing Personnel.

Report Writers allow Data Processing professionals and users to retrieve information as formatted reports in both Batch and on-line environments. Answer/2 is a simple and very flexible report writer that is used for both ad-hoc and production reports. It employs a high-level non-procedural syntax, can be used against standard files and data bases, and can be used from teleprocessing and time-sharing terminals.

Application Development Systems are non-procedural languages for programmers and analysts to implement batch and on-line applications. MARK IV, for Batch Applications, is the standard by which the success of other software products is measured. Recently reconfigured including new Array Processing, Graphics, and efficiency enhancements, MARK IV is even more powerful and comprehensive. TRANS IV is a new system for interactively creating and executing on-line applications under CICS/VS. Completely interactive, it can update and report from on-line files. Its ability to easily build screens and applications enable the programmer to build complete on-line systems without having to use traditional procedural languages.

These products will greatly aid organizations in meeting the challenges of Data Processing in the Eighties. Informatics will continue to enhance these products and develop them for use in additional environments.

# # #

RM:sab

Arthur D Little Systems, Inc. 17 NEW ENGLAND EXECUTIVE PARK • BURLINGTON, MA 01803 • (617) 272-3400

ARCHITECTURAL ANALYSIS:
MATCHING FUNCTIONAL REQUIREMENTS AND TECHNICAL ENVIRONMENTS

Dr. George O. Gardner
Mr. Michael Gauthier

Planning for information systems in the 1980's will direct more attention and professional judgement to planning the architectural environment of an information system. Conducting the architectural analysis is a key step in the systems design and development process. In the past, architectural analysis has received too little attention. Architectural analysis includes matching the functional requirements of application software and the selection of a technical environment (hardware; operating systems; application software language; file handling capability and communications protocol). Further issues in this analysis include word processing and user oriented report languages. The available options are combined into a solution set by evaluating each option with respect to technical considerations and the established organizational policies and procedures (user expectations). Arthur D. Little Systems, Inc., (ADLS) of Burlington, Massachusetts, has used one approach to architectural analysis in a current project to develop a comprehensive Student Records System for the Massachusetts Board of Regional Community Colleges (MBRCC).

The presentation will use the results of the recent analysis conducted for the MBRCC Student Records System as an example of a framework for conducting an architectural analysis. The results have been reviewed by the ten (approximately) Massachusetts Community Colleges participating in the MBRCC software cooperative. The review document included the trade-offs considered and the technical solution selected. The presentation (and paper) will emphasize how this architectural analysis framework may be generalized for other systems development projects.

integral systems, inc.
[illegible]

PREPARING FOR OMB A-21's IMPACT

In an effort to help understand the impact of the recent revision of OMB Circular A-21 (the cost principles under which colleges and universities determine costs of federal contracts and grants), Integral Systems, Inc. presented a round table discussion on OMB A-21 requirements and possible solutions. The panel consisted of representatives from higher education institutions that are addressing the wage/salary recording and distribution requirements through the ISI Higher Education Payroll/Personnel Systems. The individuals were:

William Dean, Controller
Wayne State University
Detroit, Michigan

David L. Dobbins, Controller
University of Arizona
Tucson, Arizona

Kenneth Bagby, Assistant Controller
University of Utah
Salt Lake City, Utah

Harry Grothjahn, Director
Administrative Data Processing
University of Georgia
Athens, Georgia

Robert D. Mays, Director
Computer Services
University of Cincinnati
Cincinnati, Ohio

Wayne State University, University of Cincinnati, and the University of Georgia are in the process of implementing the ISI Payroll/Personnel System and will address the OMB-A21 requirements as part of the implementation. At this time, each is planning to use the personnel activity reporting approach.

The Universities of Arizona and Utah have already implemented the ISI System. The University of Arizona is utilizing the ISI System's time reporting process to address the personnel activity reporting requirements. The University of Utah is still evaluating the monitored workload and the personnel activity approach. With the ISI's System flexibility they will be able to implement either approach.

ISI has been working closely with these and its other higher education clients to integrate the two OMB-A21 approaches into its delivered Payroll/Personnel System. The modificiations required will be made available to ISI clients as part of ISI's system maintenance service.

For further information on how the ISI Higher Education Payroll/Personnel System can address OMB Circular A-21 and the other unique and special requirements of colleges and universities, please contact a marketing representative at either of the regional offices: Flemington, New Jersey - 201/782-3600 or Walnut Creek, California - 415/938-7600.

NATIONAL COMPUTER SYSTEMS

4401 W. 76TH ST. MINNEAPOLIS, MINN. 55435 PHONE 612/830-7600

Abstract: Optical Mark Reading in Higher Education

Peter Kozachok, Vice President Sales, National Computer Systems

CAUSE: Wednesday, November 28, 1979

Optical Mark Reading, with its current level of technology, is a viable, economical alternative for data capture.

More than five hundred colleges and universities are currently using OMR in one form or another. Typical applications are test scoring, registration, surveys and grade reporting.

As the cost of data entry continues to increase, and as time contraints placed on the administration for quicker results becomes tighter, the need to use OMR in other application areas will become more prevalent.

The development of mini-computers has preceded the development of low cost, powerfully functional scanners. The day is shortly approaching where every institution, who has a computer, will have economical scanning capability. And, even those schools who do not have a computer, but who have a desire to establish and provide test scoring services, will be able to do so using an intelligent scanner.

information associates, inc.
97 Humboldt St., Rochester, N.Y. 14609 • 716 288-6900

Does It Really Require Years to Upgrade Administrative Software?

Kenneth Beasley
Director - Computer Center
Loyola University of New Orleans

Jerry Edson
Director of Administrative Systems
Vanderbilt University

What do universities do when they are faced with obsolete administrative software and outdated hardware? Loyola University, enrollment 4,500, and Vanderbilt University, enrollment 7,100, each faced that situation. School administrators analyzed their institutions' problems and came up with an approach tailored to their situation. **In both cases part of that solution was the purchase of multiple products from Information Associates, Inc.** Aside from that commonality, however, there were numerous differences in their approaches.

Loyola

Loyola's administrators decided that they wanted to replace their administrative systems with free-standing systems that would interface with each other. Since their computer was to be replaced, they viewed conversion of existing systems to a new computer as a wasted step; consequently, they purchased and installed five major systems almost simultaneously, beginning in 1977. Financial Accounting, Accounts Payable, Student Records, Billing/Receivables, Admissions and an IBM 370/125 were installed, and all were operational in a one and one-half year time frame. Three members of their five-member data processing staff participated in the effort. Preparations are now underway to install Payroll/Personnel, which was purchased in January, 1979.

Loyola has a centralized organization; there was no need for major system enhancements. Their decision to implement multiple systems at one time would have been made more time consuming if customization had been required.

Vanderbilt

Following a decision to correct both software and hardware deficiencies, Vanderbilt looked first towards the type of software they wanted. They identified the need to store a comprehensive set of data elements with simple procedures for making changes and additions. User access to the data base such as is afforded by a dictionary-driven system, a high degree of interaction among systems, and the ability to output data on hard copy, CRT screens, and microfiche were also identified. Information Associates' products could meet those needs.

Vanderbilt purchased Financial Accounting in 1976, Alumni/Development in 1977, Student Records in 1978 and Billing/Receivables in 1979. They plan to implement Degree Audit in 1980. Their decision to purchase and implement one system at a time gave them the time they wanted to make required enhancements and to become comfortable with the operation of each system.

Vanderbilt's administrative systems must function in a relatively complex environment. The university has nine schools and a hospital which includes a medical school. Systems support each individual unit plus the central administration.

Vanderbilt's schedule for acquiring hardware resulted in some conversion and reconversion of systems. Financial Accounting was tested on one machine, installed on a second, and eventually converted to a third. Most systems are installed on a new HP-3000 and are fully integrated. Alumni/Development was installed on a newly-purchased DEC 10. That system feeds gift information to the accounting system.

Evaluation

Would Edson and Beasley proceed in the same manner if they had the decision to make again? Jerry Edson says "Yes" with the qualification that he would assign slightly more programming support. While Ken Beasley says he would schedule implementation over a somewhat longer time frame if he had it to do over again, he firmly believes that their decision to install multiple systems simultaneously was correct for Loyola.

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contact: James F. Lyon

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Mr. John Lattig
Education Industry Marketing

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Query by Example (QBE)

Query by example (QBE) is a powerful, yet easy to learn and use language for manipulating information arranged by rows and columns normally found in computer generated reports. The language syntax is simple and concise yet extremely flexible. It can be used by people with little or no computer knowledge as well as those who are experts in the data processing profession.

QBE is an interactive product that runs under VM/370 and CMS and is accessed through an IBM 3277 Model 2 Display Station and keyboard. Data files can be keyed directly by the user or can be loaded through a series of utility programs provided with the product. The system in conjunction with VM/CMS provides features to protect user data from unauthorized access. QBE facilities are invoked by means of a "user friendly" dialog which helps to make the system easy to learn, use and remember.

For further information regarding these products, please contact your local IBM Marketing Representative.

SYSTEMS & COMPUTER TECHNOLOGY CORPORATION
GREAT VALLEY CORPORATE CENTER ■ 4 COUNTRY VIEW ROAD ■ MALVERN, PENNSYLVANIA 19355 ■ 215-647-5930

A STUDENT SERVICES SYSTEM FOR THE 80'S

John J. Woolley, III
Principal Consultant
Educational Systems Division

Many institutional leaders are aware that traditional recordkeeping methods do not meet the demands of today's students, institutional management and external reporting and/or funding agencies. The pressures for accountability and the likely potential of declining student enrollment have forced to the surface the need for educational planning and evaluation as an integral part of the educational mission of the institution.

In the role of facilities management and proprietary systems development, SCT Corporation has recognized this growing need and has been developing a synergistic approach to computer support of the Student Services arena. Our experience has demonstrated the need for an integrated student data management system as the basis for sound management planning. THAT IS, without good student academic and financial records as the "data base" for strategic evaluation, little if any management planning (which requires substantive data) may occur.

What are the characteristics of a good Student Services System for the 80's? Systems currently operational at MIT, Cuyahoga Community College, Wayne County Community College and planned for future installation at Temple University and San Diego Community College District serve as models for this overview.

This system design employs state-of-the-art concepts and technology. Based on an integrated common data base, the system recordkeeping function is improved by providing on-line access, update and reporting capabilities for all student-related administrative functions such as

Admissions and Records, Accounting and Business Office, Financial Aid, Catalogue and Course Schedule Development, Counseling and Advising, Educational Planning and Evaluation, and Management Planning, among others. The result for the future is a proper integration between student system functions and related financial functions.

The system must incorporate required features which promote a user-friendly environment such that an on-line transaction driven capability will integrate easily into daily office functions, require minimal training of non-technical user personnel and provide appropriate error and update verification facilities.

This system offers timely, efficient processing for update and inquiry, securing the data thereby preventing unauthorized access, maintaining data within institutionally mandated retention periods, and provides summary statistics and transaction logs to facilitate audits of the system. Additionally, it permits authorized users an on-demand audit trial for verification of changes made, has internal control statistics for continual system performance evaluation and tuning, and provides appropriate back-up and recovery data files and procedures in case of loss of current data base.

PANSOPHIC

PANEXEC AND EASYTRIEVE FOR THE 80's

PANSOPHIC presents new facilities in EASYTRIEVE, the Report Generating and File Management System, and PANEXEC, the Control System for Executable Programs.

New enhancements to EASYTRIEVE have provided both non-DP and DP users more capabilities for usage in the College and University environments. The use of the system will be discussed and handouts of application areas will be provided.

PANEXEC, the Control System for Executable Libraries, will also be discussed. For the first time, DP management will be provided information about what programs are being executed, by whom, on what, and how the program is being initiated. Control of the DP environment will be stressed. Cross reference information from source programs to executable programs, as an example, is provided automatically with PANEXEC.

PANEXEC now provides an interface to a data-file security system for program to data-file additional security.

For further information, product literature, or pricing, please contact:

Robert S. Briggs
Midwest Regional Manager
PANSOPHIC SYSTEMS, INC.
2122 York Road Suite 110
Oak Brook, IL 60521

(312) 986-6070

1-24-82

TRACK VI
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EDP MANAGEMENT CHALLANGES IN THE 1980'S

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ABSTRACT

Data Processing has always been a rapidly changing industry. Changes during the 1980's are projected to be more rapid and dramatic than in previous decades. Advances in semiconductor technology will be the primary catalyst of change. Semiconductor technology will continue to miniaturize and reduce the cost of central processing units. In addition, semiconductor devices will make significant progress in replacing existing technology utilized for mass secondary data storage.

The new low cost hardware will result in a series of challanging problems for EDP management. The most serious problems will stem from increasing impatience on the part of the user community with large system development costs and timeframes.

While hardware technology has developed exponentially, software development methodologies have progressed at a relatively slow linear rate. The increasing gap between these two necessary components of data processing will

precipitate management problems of huge proportion in the 1980's. While an individual EDP manager cannot completely solve the problems, his survival may well depend upon how effectively he copes with the situation.

Solutions to the software development problems of the 1980's will be measured by their ability to optimize two objectives. The two objectives are: 1) Minimize the amount of time required to transform an idea into a computer based reality and 2) Maximize the useful life of resulting computer systems. Some of the potential solutions that will be analyzed in terms of their ability to optimize these objectives will be: structured development methodologies; table driven logic; and general purpose report writers.

For additional information contact the author directly.

SERVICES/REQUIREMENTS ANALYSIS:

A METHOD FOR GATHERING USER INPUT TO ACHIEVE A SUCCESSFUL SYSTEM DESIGN

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As university information needs evolved in response to environmental changes, both mid-level and senior-level management recognized the necessity for expanded user involvement in acquiring, maintaining, and manipulating essential institutional information. The need for a new student information system provided the forum for a thorough institutional review of information processing capabilities in light of recent technological advances. Recognizing that any expanded information environment would be user oriented the user community had to be incorporated into the system design and development process. A two-member project team with full release time from previous responsibilities was created representing technical and user interests and was housed together in a new office. The project team was responsible to a three member task force representing user, technical and management interests. From the outset the emphasis was upon user involvement in system design and development. The project team developed a technique referred to as Services/Requirements Analysis (SRA) derived from a procedure developed by Performance Development Corporation (PDC) known as Service Analysis. Using SRA, the user community was able to perform a thorough self-analysis of its information needs and to identify individual major and crucial organizational activities. Major and crucial functions or activities, were those organizational activities which were essential to that department or division's mission and responsibilities. Typically these functions were few in number, embracing the broad spectrum of departmental responsibilities. From departmental major functions, benefit groups, which shared common functions and responsibilities, were identified. Benefit group membership frequently crossed formal departmental boundaries because group membership was based upon functional rather than organizational relationships. Benefit groups shared responsibility for accomplishing similar major functions, thus providing the basis for system implementation. Dissection of the project into modules to satisfy benefit groups permitted the project team to define and implement logically and functionally related services to satisfy a common community of need. The project team was able to integrate benefit group information needs (from the definition of major/crucial functions) into a series of system attributes. The role of the project team was one of synthesizing user expressions of need, into a coherent systems package. The approach appears to have been successful both in defining system parameters and in generating sustained user interest and commitment.

AN INFORMATION FLOW ANALYSIS OF UNDERGRADUATE ADMISSION PROCEDURES

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An analysis of the procedures and the flow of information relative to the admission of students to the undergraduate program of Florida State University was conducted. The analysis was conducted in response to numerous problems that arose under the present system which were the result of apparent gaps in the information flow from application for admission to registration of the student. Examples of the types of problems arising included student complaints about having to complete numerous forms asking for the same information, and in some cases complaints from students who had been awarded financial aid but had been rejected for admission to the university. The analysis showed serious gaps in the flow of information, information-management subsystems working at cross purposes to one another, and unnecessary redundancy in the overall system. An integrated information-flow and decision-flow system was designed to meet the needs of the university and obviate the possibility of the types of problems existing under the old system. The system is developed in detail along with implicit attendant policies and procedures.

ADVISEMENT AND GRADUATION INFORMATION SYSTEM

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As Miami-Dade Community College implements its new general education program and Standards of Academic Progress, the College has made a commitment to provide the best advisement information possible for student and faculty advisor use. One such system, the Advisement and Graduation Information System, provides such help by realigning students' transcripts according to requirement areas rather than by semesters. Students are informed as to the progress they are making toward completing the requirements of a specific program of study. Requirement areas that are completed are so indicated and those requirements that are still needed to be taken are noted for the student. The system also checks for graduation certification. If the student has satisfied all graduation requirements, the system will automatically graduate the student and place the graduation remark on the permanent record.

It is estimated that this computer application will save the College a minimum of $50,000 a year paid for professional staff members to work extra days to approve graduation certifications at the College, as well as the time spent on providing preliminary grad-checks during the academic year. The time that advisors and counselors formally spent performing these routine grad-checks will now be eliminated.

In order to provide the student and faculty advisor a listing of courses suggested by the state universities for transfer, this system also generates a grid of suggested courses by major and university for each student. Students are informed if they have completed, currently enrolled in, or enrolled for a future term in any of the required or suggested courses for transfer. This allows this student to easily compare requirements amongst the universities, and also to note how they are proceeding in meeting the requirements for transfer to the upper division colleges and universities in Florida.

The Advisement and Graduation Information System will provide the most accurate and up-to-date information on the graduation status of a student. This system will in no way replace the professional advisor and counselor, but will allow the advisor and counselor to spend more time discussing students' goals and program requirements rather than spend time in clerical details.

The second phase of this project involves the development of suggested sequencing of courses based upon students' background, educational goals, and the particular upper division institution to which students wish to transfer. This second phase, when coupled with the initial Advisement and Graduation Information System, will provide a very complete advisement picture upon which students can make informed academic decisions.

AUTOMATING FINANCIAL AID: A CRUCIAL AREA IN THE 1980'S

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Abstract

This paper discusses the design of an automated financial aid system at the University of Southern California. It outlines the process by which a student applies for and receives financial aid, and then it illustrates the method by which the considerations for good automated system design are applied to the financial aid process. The paper then describes the actual automated processes that are used in the USC financial aid system and highlights the "packaging" program which is the central element in the design. Finally it describes the cost benefits of the system, as well as its attributes.

A MEDICAL COLLEGE STUDENT INFORMATION SYSTEM

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The student information system used by the College of Medicine of The University of Kentucky came into being as a result of the growing demand for accurate and timely information dealing with all aspects of the operation of the Office of Academic Affairs; it consists of three parts: admissions, student records, and alumni records. The system is implemented on a subset of IBM's Conversational Monitor System called Conversational Job System (CJS). CJS is installed on an IBM 370 model 165 computer operating in batch mode under O.S. The CJS component allows the user to conversationally create and edit on-line files and submit jobs stored on-line to the batch system and thus draw fully on the resources of the IBM 370.

The admissions subsystem of the student information system aids the Admissions Office in the task of processing the more than 1,000 applications the Medical School receives annually. It places new applicants on the master file, keeps track of their progress through the admissions process and records and reports the final status of each applicant.

The student record subsystem maintains the master file, generates class rosters, schedules courses for each student in the first two years and aids in the scheduling of courses in the clinical years, records grades, calculates grade point averages, generates feecards for use by the University's bursars office, and produces reports for the administration.

The alumni subsystem maintains information such as class year, name and address, specialty, place and type of practice. This information is used to generate various reports, mailing labels, and data for statistical studies.

Most data processing within the Office of Academic Affairs is performed at the desk of the person responsible for accomplishing a task, be it recording grades, processing applicants, or updating alumni records. The users have little or no contact with the computing center which is a half mile from the College of Medicine. The users are not programmers or computer oriented; but they use the computer to aid them in the performance of their duties.

Virginia Tech: Ready for Fund Raising in the 1980's

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During the 1980's private donations and support to colleges and universities will become of increasing importance as state and federal funds diminish and inflation contributes to increased operating costs. Each gift, whether large or small, is becoming increasingly more important and must be processed quickly and individually acknowledged. Virginia Tech, recognizing the continued need for private support and its importance, has implemented a comprehensive biographic/gift giving system. In addition to processing all biographical records of alumni and donors the system processes all gifts including restricted gifts, pledged gifts, matched gifts, and those gifts related to planned giving. This paper presents the solution Virginia Tech has implemented relative to the solicitation and acknowledgement of gifts to the University.

ISSUES ON THE DEVELOPMENT OF A CLINICAL INFORMATION SYSTEM FOR AN ACADEMIC DEPARTMENT OF PSYCHIATRY

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The stepwise development of a clinical information system addressed to facilitate effective communication among patient evaluation, treatment, research and administrative programs in an academic department of psychiatry is presented. Issues involved in the task of promoting simultaneously and integratively specific clinical, educational and research missions of the department are discussed.

This paper focuses on the initial patient evaluation process as a starting point for building a patient-centered clinical information system within an academic psychiatric institute.

Objectives set for the initial evaluation procedure include:

1. To provide a basic description of the patient's condition, adequate to: (a) justify initial disposition decisions, (b) serve the initial informational needs of the receiving treatment programs, and (c) satisfy medical record requirements.
2. To provide information and suggestions to the evaluator for the assigning of the patient to the most appropriate treatment program.
3. To promote the education of trainees and staff on psychopathological assessment.

4. To facilitate the detection of candidates for research protocols.
5. To constitute the starting point of a system for tracking the programmatic course of the patient while under the care of the institute.
6. To provide systematic data about the characteristics of the patient population entering the institute.

Operational features of the development and implementation of the initial evaluation form and procedure include:

1. To be developed in interaction with both the clinical evaluators and the users of the information (treatment and research programs), at all staff levels.
2. To be workable: simple, brief, perceived as helpful by the evaluators.
3. To include a narrative component (for flexible description) interdigitated with a standardized component (to insure coverage of key clinical variables and to allow computerized information retrieval).
4. To provide feedback to the evaluators.
5. To be self-monitoring to maintain adequate levels of reliability and usefulness.

THINK SMALL

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"Think Small." The theme of this paper could just as easily be "Keep It Simple, Stupid"; or "If It Is Complicated, Then It Must Be Bad"; or "If It Is Easy To Write, Then It Will Be Easy To Change." This paper explains the simplicity of system design and productivity techniques used in the development of an On-Line Management Information System at Boston College. The simplicity of system design means that all terminal transactions in the system are limited in function, small in size, uncomplicated and easy to implement. The major advantages of this approach to system development are rapid installation and a sharp reduction in program maintenance.

STANDALONE TURNKEY MINICOMPUTER SYSTEMS--A COST EFFECTIVE SOLUTION FOR AUXILIARY ENTERPRISE DEPARTMENTS

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The Urbana Office of Administrative Information Systems and Services has developed and implemented a consulting service for the acquisition of turnkey minicomputer business systems. The author developed a procedure and a bid proposal format and has consulted for six auxiliary enterprise departments over the past eighteen months.

The paper describes the tasks that are necessary for establishing a successful consulting service to include outlines of policy and bid proposal documents. Experiences and pitfalls are mentioned along with the main theme of how to do it. The paper is in outline format and is restricted to a summary of the key points. The bid proposal outline is complete enough to be used with a specific application if it is exploded into narrative form by the user.

The user requirements section is discussed without giving an example. Equipment requirements and logical file design must be included with the functional analysis for each specific application. The ADP consultant must be experienced in performing and documenting this analysis.

COMPUTER-ASSISTED ADVISEMENT
AND EVALUATION SYSTEM

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Colleges and universities must become more innovative in the 1980's if they are to meet the double-barrel challenge of dealing with rising costs due to inflation and reduced budgets due to declining enrollment. A partial solution to these problems is the utilization of computer technology to perform routine administrative and academic tasks. An example of effectively-applied computer technology in education can be found at Georgia State University (GSU). GSU uses a computer-assisted advisement system to routinely inform students as to their progress in fulfilling their degree requirements. The system provides each student with an up-to-date evaluation of their academic record. The system is simple and straightforward. It compares the degree requirements as specified in the University catalog to the courses a student has taken, and determines which degree requirements have been satisfied and which requirements are outstanding. Consequently, students can make informed decisions when registering each quarter.

LET YOUR COMPUTER TAKE ADVANTAGE OF THE COLLEGE BOARD

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The College Board is nationally known for its work in the measurement of students' academic aptitude and achievements, as well as families' ability to contribute to the cost of education. The scope of its efforts in those areas has made the College Board a major supplier of information about students in transition from high school to college. To enable institutions of higher education to make better use of the student information that it provides, the College Board has developed a series of supporting services and computer software. Often free or, at worst, very reasonably priced, the College Board's campus-based Management Services cover a wide spectrum of interests: from institutional research to recruitment and from admissions to financial aid operations.

This paper provides a brief overview of the specific College Board offerings with an emphasis on how they can be integrated with other institutional systems.

A PREVIEW OF APPLICATIONS FOR THE 80'S

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ABSTRACT

Six applications which are now operating state-wide in New Jersey are expected to run unchanged through the decade of the 80's. They are extremely popular and have been accepted into 14 of the Network institutions. They all run online at low-cost terminals under the control of the local using offices. One hundred fifty terminals deliver these services. Examples of the operational dialogues are included.

The applications include 1) word processing with spelling checker, 2) electronic mail, 3) student curriculum analysis, 4) library circulation using bar codes, 5) TimeShare's guidance information system, 6) computer literacy CAI.

The software users in the 80's are likely to demand three qualities in their systems: simplicity, user control and non-centralized scheduling. The six applications above will be shown to meet these criteria. Each of them illustrate innovative ways of implementing user-controlled software.

Experiences Implementing a Purchased Software Package

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Recently, The University of Alabama purchased an applications software package to process one of its financial systems. The administrative programming staff was directed to convert this package for use on the University's Univac 1110.

This paper is a result of the "learning experience" of the conversion effort and subsequent research on software packages. Pro's and con's of packages, in general, are presented. The conversion effort at the University and the problems encountered are described, along with current problems and mistakes made along the way. A strategy for the selection of a software package is then given.

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HOW TO ACHIEVE ACCURACY, RESPONSIVENESS, AND EFFICIENCY IN A STUDENT RECORDS SYSTEM

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This paper is an account of a cooperative venture by Yale's Office of Institutional Research (OIR) and Student Records Office (SRO) to design and implement a student records system which satisfies the needs of both offices. The system successfully resolves one of the most common problems in the development of university information systems--it meets both the day-to-day operational needs of the user office (SRO) as well as the more ad hoc analytical needs of the central administration (as represented by OIR). The paper identifies the three criteria by which the success of this or any information system must ultimately be judged--the need for accurate data, readily available in a timely fashion and an appropriate form, and with efficient use of the University's personnel and technological resources (i.e., low cost). It describes the critical design considerations which we found to be most effective for satisfying these criteria: (1) user control of the system and the data it contains, (2) flexibility in the information content and output of the system, and (3) the ability to integrate the data and coordinate the functions of the different offices (including the central administration) which must use the data stored in the system.

This paper offers user operation of a dedicated minicomputer (or alternatively of a system developed on a centralized mainframe computer, if the requirements for user control and flexibility can be met) as a viable option to those offices evaluating their data processing needs. Based on our successful experience in SRO, these principles are now being applied in other offices and record systems at the University.

MARKETING INFORMATION SYSTEMS WITHIN A NON-PROFIT ORGANIZATION — IF THEY DON'T KNOW ABOUT IT, THEY WON'T WANT IT OR USE IT

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The concepts of marketing which have long been valued by the profit making organization are gaining popularity with non-profit organizations as a way to improve services to their clients and to increase support for their operations. At the University of Michigan a further step has been taken and the principles are being used by the Office of Administrative Systems to improve its ability to satisfy the needs of the administrative units within the University.

Marketing is more than advertising or selling, it is the development of an attitude within an organization that the purpose of the organization is to understand the customers or users needs and satisfy them by designing and offering services and products in terms of the users needs and desires.

The marketing program as implemented by the Office of Administrative Systems involved a reorganization of the management structure as well as reassignment of functions and responsibilities.

Implementing a marketing program requires that three types of analysis occur. The first, goal identification or mission analysis requires the participation of the entire organization to determine what business you are in and what needs are to be satisfied. The second, resource analysis involves identifying the strengths, weaknessess, products and services of the organization. In addition opportunities for expansion are identified. The third is a needs or market analysis. This last analysis involves the participation of the customer or user community because the needs that are to be satisfied are their needs.

The ability to answer the questions posed by the three types of analysis will determine the success of the marketing program and also the success of the organization whether it be profit or non-profit, business or education oriented, corporation or an internal auxiliary unit such as the administrative data processing department in a University.

A FACULTY POPULATION BALANCE

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Purdue University has developed a Faculty Projection Model based on probabilities of termination, retirement, and promotion which estimates the population of faculty by rank and department under various hiring policies. The model interfaces with enrollment projections propogated via an induced course load matrix to permit concurrent faculty load modeling, and may be interfaced with salary data to provide economic data.

The output of the model is the required versus the available faculty in any projected year (ideally, zero). The model contains two sub-models: the first, a model to project faculty available by school, and second, a model to project the credit hour demand. The implementation of the projections is carried out by EFPM, the EDUCOM Financial Planning Model. This very flexible routine will handle up to 560 variables and permits up to 10-year forecasts subject to various constraints and including tradeoffs. As well as simply computing the estimated future consequences of continuing present policies, the model will compute the faculty required to maintain any desired ratio of credit hours to FTE, or can be used to test the effects of policy changes which affect hire rates or the probabilities of termination, retirement, promotion, etc.

Another useful output that can be obtained from the model is the approximate partial derivatives of output variables with respect to input variables for those cases where the parent relationship is not available in analytical form; for example, the rate of change of credit hours that must be taught in Science with respect to changes in Engineering enrollment. Such linearized approximations permit summarization of the effects of limiting enrollment in various disciplines, closing entire departments, etc.

The model furnishes a useful vehicle both to raise a variety of management questions and to make rough tests of new policies in the enrollment and the faculty hiring and retention areas.

Planning and Implementation of a Total Computing System for Wayne County Community College: A Case Study

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This case study illustrates how strong top management support, coupled with a dedicated existing staff and the strategic use of external consultants, can enable an institution to make a quantum leap in computer services within an exceptionally brief time line.

Some of the unique components of the project were (1) an objective, college-wide study by an external agency (SCT) to identify existing needs and anticipate future uses; (2) the subsequent adoption by the college of a long-range computing services plan; and (3) the creation of an entirely new academic/instructional support function beyond the existing administrative function. Several interesting factors requiring consideration were (a) the need for policies anticipating future use and evolution of such a total system; (b) the education of a large faculty (many of whom are part-time) in the utilization of the facility; and (c) sensitivity to human factors in a somewhat threatening and rapidly changing environment.

The purpose of this paper is not to outline the hardware considerations that went into the formation of the total system but rather to focus on the human factors that were addressed in the assembling of an automated system designed to support administrative and academic users. The President and Board of Trustees of WC3 had agreed that in order for the college to fulfill its commitment to the citizens of Wayne County, it must deal with the issue of Computer Literacy in order to enable the college community to cope with the demands and needs of an increasingly technical society. It was also felt that faculty and students should be familiar with the idea of the computer as an instructional and research tool; and, lastly, that WC3 could increase student academic success by meeting the need for diversity of instructional modes for its widely heterogeneous student body through the development of computer assisted instruction (CAI) in its basic reading, composition, and mathematics courses.

The success of this pervasive effort depended greatly on the careful handling of the following potential "human factors mine-fields":

1. Differential acceptance rates and motivational levels on the part of the general faculty, administrators, and DP faculty.

2. The fact that the implementation of the system served as a most opportune chance for job descriptions and reporting structures to be rewritten.

3. The establishment of multiple one-to-one communications and planning interfaces at all levels: from users/technicians to top administrators.

4. Consideration of the personality characteristics of the technicians hired to staff the network, given the unavaoidability of their interaction with a wide variety of users.

5. The mass drain of college financial support

That success was attained is attested to by several different performance evaluation measures: these seem to speak to the effectiveness of the effort to respond to human sensitivities by creating and increasing awareness, comfort, and motivation with the entire project through specialized training and active participation in the various phases of its implementation.

THE IMPACT OF THE GROWTH OF THE APPLICATIONS SOFTWARE INDUSTRY ON SYSTEMS DEVELOPMENT IN THE 1980'S

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This paper deals with the technological changes in the data processing industry and the tremendous growth of the application software industry and assesses some of the major impacts which the application software industry will have upon individual data processing installation in the 1980's. Primary among these impacts will be the migration of programmers into application software companies as these companies grow at a projected 30% annual rate. This will leave even fewer and more expensive resources available for individual data processing managers to perform other development activities. However, additional software development tools are under development and will be used not only by application software firms but will be marketed so that software development can be facilitated. However, an overall increase in programmer productivity is not expected to make any major change in the resources required for system development.

THE CHANGING ROLE OF THE MIS PROFESSIONAL: FROM PROJECT LEADER TO PROJECT COORDINATOR

by

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In the early 1970's, the Data Processing Project Leader was the focus of responsibility for the success of any new system implementation. In charge, in a line position, as manager, the Project Leader defined and assigned tasks, determined and delegated responsibilities, and budgeted funds. The user departments functioned as staff to the project, providing input but not decisions, defining processes but not sharing responsibility for the systems's success or failure, even though this would be the user's system, which they would have to utilize on a daily basis.

Today, we at Hahnemann are shifting the focus of these responsibilities. With the user designated as Project Leader and the MIS Senior Systems Analyst as the Project Coordinator for each new system, the MIS professional is functioning as staff to the project.

This MIS role results in the following benefits:

- User responsibility and increased participation in the tasks necessary to insure system success.
- Functioning of MIS as a key to the user learning process as regards system capabilities and limitations.
- Formation of a mutually-dependent team of MIS and user, jointly responsible for decision-making.

In a distributed processing environment, the system-knowledgeable user is critical to the successful implementation.

This paper will explore these shifts in the content and context of the MIS professional's role, and their resulting impact on system projects.

MIS AND MANAGEMENT PLANNING

What Should Be Expected?

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Many believe that automated information systems will develop to the point of being primary tools in management planning in institutions of higher education. The potential seems great, but so do the limitations. What is reasonable to expect, now and in the near future?

Some relevant characteristics of planning and of management information systems are reviewed in an assessment of potential automated information systems support to the planning function. Insights are taken from experience in a planning process and from recent literature on both subjects.

EMPLOYEE PERFORMANCE APPRAISAL: PREVENTIVE MAINTENANCE FOR A VALUABLE RESOURCE

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Many people and organizations view employee performance appraisal as a tool for reward distribution. Few, however, tap the potential of an appraisal system for stimulating organizational communication, gaining feedback, and boosting morale. It is common to spend thousands of dollars to provide preventive maintenance for hardware, and we seldom object to the time and expense involved. Why then should we as managers object to spending a little more time in providing the same type of care and maintenance for our most valuable resource, people?

A two-way appraisal system that involves multiple levels of management actively participating in a free and open dialogue can stimulate organizational unity, identify problems early, and facilitate healthy communication.

MAKING INSTITUTIONS RESPONSIVE TO COLLEGE STUDENTS: DATA THAT MAKE A DIFFERENCE

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Abstract

Most institutions of higher education already have the potential to respond to students in individualized ways and to give direction to institutional planning. Schools have students; they have computers; they have systematically collected data. Two concerns dampen this potential, however: what needs to be known and how to respond once the data bases are created.

The problems lie, this paper asserts, in higher education's 1) reliance on "canned" research, which, due to the need for nationally marketable instruments, often restrains development of local modes of assessment; 2) on the inability to make traditionally collected data "speak" once they have been collected; and probably even more to the point, 3) on the lack of models by which student personnel professionals are even seen as translators of assessment results into meaningful action.

The paper addresses all three of the above concerns, following the thesis that to the extent that student personnel can make institutional services visible to students and can make students visible to institutions, they might

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claim as part of their task the role currently being given to "institutional research and development."

Since one crucial part of translating data into action is to place timely, usable information into the hands of decision-makers (including students!), the paper presents three places to begin using data more creatively:

1) Explicit student requests. With computer technologies, there is no reason that beginning of the year surveys cannot include questions such as, "I would like to have the following information. . . " or "I would like to be contacted by a career counselor by December 1." Such questions can be met with straightforward computer applications as generating mailing labels or phone listings. Numerous prototypes of survey questions are listed in the paper.

2) Explicit institutional requests. Having the simple perspective of a frequency distribution provides a knowledge of the "larger picture" within which the individual fits. This section of the paper outlines numerous requests made by official agencies of the college -- again met through available technologies-- and outlines implications for planning at the institutional level.

3) Latent institutional and student concerns. Analysis of the group's responses, and populations within the group, make it possible to identify additional characteristics of students, not readily visible without statistical applications. Examples listed in this section of the paper include analysis of variance and certain nonparametric studies of issues such as probation, future trends of the institution, and retention. Attempts to predict on the basis of a questionnaire students who will more likely drop out of college, for example, are explored, particularly as they relate to the local situation.

ADMISSIONS: AN ON-LINE SYSTEM WITH A WORD PROCESSING INTERFACE

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A multi-campus on-line admissions system has been developed for the University of Massachusetts system. Each admissions segment at the campus locations has retained its individual autonomy while also participating in a common admissions system, components of which consist of freshmen, transfer and graduate admissions, as well as special schools and programs. All data entry and most updates to the Data Base are done on-line with immediate access. All actions by the admissions staff are pre-programmed to allow for an automatic word processing interface. These actions enable folders, labels, cards, various personal letters and other communications to be produced. This system will automatically and efficiently send a student, via the word processing interface, decision letters and other correspondence, such as personalized letters describing particular campus departments and programs.

The Admissions office can respond to the information needs of other University offices by using the system software to produce their own reports, statistical studies, labels and OS 6 letters without a Management Systems interface for all requests. These capabilities should strengthen the communication power and efficiency of admissions offices within the University and enable them to perform more effectively their increasingly diverse and challenging responsibilities. The system also facilitates admission office involvement with outside agencies, such as the College Board, Admissions Testing Program and Project CHOICE. In general, this on-line system can be a dynamic, flexible system which will both enhance daily processing functions and also help establish a systematic procedure for making well-informed, short- and long-range management decisions.

As institutions of higher education confront the challenges of maintaining enrollments and high quality educational programs in the face of declining enrollments and smaller budgets, admissions offices will be vitally important to institutional well-being, particularly as they move increasingly toward institutional planning, needs assessment, retention studies and sophisticated recruitment functions. The integrated admissions system at the University of Massachusetts is taking advantage of hardware and software technology in computer processing to anticipate and respond to the challenges of the 1980's.

FROM PRE-APPLICANT TO ALUMNUS: A COMPREHENSIVE NEW SYSTEM AT L.I.U./BROOKLYN CENTER

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In Fall 1978 the Brooklyn Center of Long Island University went on-line with a new student admissions and registration system developed for the Center by Systems Research, Inc.

Prior to Fall 1978 the data processing functions of this urban-based university were limited to a batch registration system on an IBM 1130 which required both extensive supporting staff and extensive intermediate paperwork; no computerized admissions system existed. The old system was decidedly ineffective in solving administrative reporting needs and in providing student services (it too often took 24 hours for a student to receive his bill).

Since last Fall, the new system has been processing on a DEC-system 2040 some 8000 students during each registration period in both a mail-in or preregistration mode and a "field-house" or in-person mode. Students now receive completed invoices within fifteen minutes of registration initiation. The system also provides for distributed file maintenance as various offices throughout the University can access and update relevant data on their respective terminals.

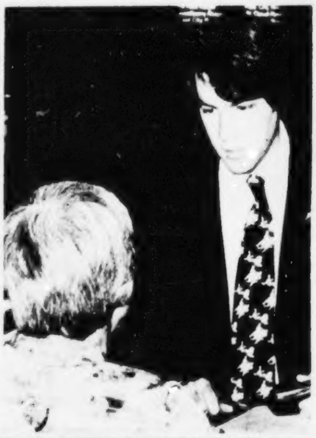
Other features of the system include:

- a pre-applicant module which provides for tracking and maintenance of contacts with prospective applicants and accepts input from both proprietary mailing list tapes (CEEB) and in-house terminals;

- an admissions module which develops a complete profile of the applicant including all relevant demographic, academic, and student interest data;
- a registration module which allows for either on-line batch mode registration, interfaces with the admissions and student files, and provides for registration limitations and/or conditions. The registration system interacts with the course file and the enrollment file, each of which contains pertinent information that enables more accurate reporting of faculty and student workloads and campus requirements; and
- an alumni module which allows for maintenance of alumni demographic data and "giving" histories.

As a result of the new system, service to students has improved markedly, data is readily available through an ancillary query language and formal reports, and the Center is able to deal more effectively with the realities of declining enrollment in the 1980's.

ADDITIONAL PHOTOGRAPHS FROM THE 1979 CAUSE NATIONAL CONFERENCE



TRACK II
DEVELOPMENT OF
INFORMATION SYSTEMS

ADDITIONAL PHOTOGRAPHS FROM THE 1979 CAUSE NATIONAL CONFERENCE